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THE

PRINCIPLES AND PRACTICE

OF

MEDICINE.

BY

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SECOND EDITION, REVISED AND MUCH ENLARGED.

IN TWO VOLUMES.

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TO THE

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GOVERNOR OF BOMBAY.

IN GRATEFUL ACKNOWLEDGMENT OF THE
WARM INTEREST EVINCED IN THE SUBJECT OF EDUCATION,
AND THE CONSTANT EFFORTS
TO PROMOTE ITS SPREAD AMONG THE NATIVE
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PREFACE TO THE SECOND EDITION.

THE very favorable reception which was accorded to my work entitled 'A Digest of the Principles and Practice of Medicine,' published in 1879, has induced me to prepare a second edition in an enlarged form. In pursuance of this object, I have gathered from every attainable source the knowledge which I have considered important, and made free use of the materials afforded by the numerous works I have consulted. These materials have been maturely considered and scrutinized; and I have, I trust, not failed to insert a considerable amount of my own personal experience. The task of preparing a work of this kind is for obvious reasons a very difficult one. I need only allude to the ever-increasing number of topics and the details connected therewith; to the labour of sifting and examining manifold opinions and statements contained not only in standard works, but in the current medical periodicals; to the enormous expansion of pathology; and lastly, to the vast number of new remedies and methods of treatment which are almost daily suggested.

It had been my intention to devote some part of the work to a description of the native remedies (many of them of much value) largely in use in the East. I found, however, that the accomplishment of this purpose would cause a large increase in the size of my work, the dimensions of which are already considerable. I trust, however, at an early date to be able to supplement these volumes by the publication of a work on Indian Materia Medica, and the therapeutical uses of Indian bazaar drugs.

In the preparation of this second edition I have endeavoured to give a plain and practical account of the subjects treated of, and to describe the present condition of medicine as practised by the leading authorities. I have devoted a considerable portion of the first volume to the subjects of etiology, symptomatology, the physical signs of disease, terminations, prognosis, &c. These are followed by the descriptions of special diseases. The task of revision has been lightened by the aid of my friend Dr. T. P. Smith, of Reigate, who has carefully examined my manuscripts and the proof sheets.

I now submit my work to my professional brethren in the hope that they will judge favorably of my efforts. I am fully sensible of its deficiencies and imperfections. Its preparation has involved much care and labour, and caused me to appreciate the difficulties of the task. Should a third edition become necessary, it will be my pleasurable duty to correct as far as possible any defects which a fair criticism may point out.

RUSTOMJEE NASERWANJEE KHORY.

Girgaum Road, Bombay;
January, 1885.

PREFACE TO THE FIRST EDITION.

This book is offered to the medical practitioner and the medical student in the hope that it may be of use to the one for ready reference, and to the other as a convenient means of revising his studies. I have therefore thought it advisable to avoid all attempts at style or elaborate detail, which, in a work intended for the general reader, would unnecessarily augment the bulk of such a volume as this without materially adding to its usefulness to the class of readers for whom it is designed.

As will be seen at once, I have drawn largely upon known medical authorities, to whom, once and for all, I acknowledge my deep indebtedness. A work like this is essentially an embodiment in a convenient form of the contents of standard medical writers, and of the hypotheses and facts which modern research has given to the world.

The book begins with an account of symptoms in general, or a description of the chief observations which indicate the existence and nature of disease. These are classified according to the parts of the organism in which they are manifested. Thus, all the symptoms manifested by the respiratory tract are taken together, whether indicating disease of that region or associated with disease of other organs. The principles upon which a diagnosis is made are next discussed, and I have followed Susruta in making prognosis the subject of a separate division. The main principles of treatment complete this general view of the subject.

The account of the various diseases follows, and occupies the greater part of the book. Each disease is first defined. Its causes, pathology, morbid anatomy, symptoms, diagnosis, prognosis, and treatment are described *seriatim*. This, with a slight modification, is the order of the mediæval writers on medicine.

> "Serapyon, Rhazes, and Avycen,
> Averrois, Damascien, and Constantyn,
> Bernard, and Gatesden, and Gilbertyn."

Their pages are seldom turned over now, their method was not favorable to the discovery of scientific facts, but they lived in an age in which scholasticism had brought formula to the highest perfection, and I hope that the uniform order which I have adopted from them may prove as useful to the modern student as it doubtless was to the subtle disputants of Salernum and of Montpellier.

In other respects I have in the main followed the beaten track, except that I have more often than is usual resorted to tables for the purpose of clear exposition of resemblances, differences, and details, and that I have introduced a short account of insanity under diseases of the brain, and a short abstract of toxicology among diseases of the stomach. Hippocrates has a treatise on ancient medicine, and I have felt that a short account of the growth of the observations and hypotheses which my book contains was the most fitting conclusion to it, and I have accordingly printed a letter which a Fellow of the College had written to me on the subject. Modern investigations have, it is true, shown that our Susruta is no native Indian, but Hippocrates himself, and that the Eastern learning, as regards medicine, is a reflection of the scientific brilliancy which so early appeared in the West.

If, however, India cannot claim the origin of medicine, her practitioners have, at least in modern times, discovered and brought into scientific use numerous valuable remedies. Of these I have given a series of tables and prescriptions. Of the efficacy of a large number of these drugs I have made numerous trials, and obtained satisfactory proofs.

Dr. Burjorji, Physician to H.H. the Maharaja of Bhownuggur, has been so good as to assist in this part by sending several native prescriptions which, with others of my own or of general use, are appended to the table of bazaar drugs.

I have been indebted to Dr. Birdwood's catalogue of "The Economic Products of the Presidency of Bombay" in preparing this list.

I have prepared myself for the work by an extended course of reading, and by observation of the methods of medicine in several parts of India as well as in the hospitals of London, Brussels, and Paris. If my book proves useful to even a few of my professional brethren, whether practitioners or students, I shall have received a sufficient reward for my reading and my travels.

In conclusion, I beg to convey my sincerest thanks to the teachers of St. Bartholomew's Hospital in general, and especially to Dr. Andrew, Dr. Gee, and Dr. Moore, for opportunities of observation, or for suggestions during the progress of the work.

RUSTOMJEE NASERWANJEE KHORY.

5*th March*, 1879.

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MEDICINE.

THE preservation of health and the cure of disease are the objects of Medicine. The study of symptoms and of the action of drugs, with pathology, which is the physiology of the morbid action of organs, and morbid anatomy, which tells of the appearances found after death as a result of pathological changes, make up the science or rather the extended circle of sciences included under the general term Medicine. It is obvious that no scientific boundary separates medicine from surgery or from gynæcology, but for the systematic study of disease these divisions are convenient, and I have adopted them, so that for the purposes of this book medicine may be taken as synonymous with the practice of a modern physician. I have therefore left the student or the practitioner to refer to works on surgery or gynæcology for all diseases requiring operation or a peculiar training, alluding to them only where their insertion is essential to a complete description of the medical aspects of disease.

In the arrangement of diseases I have chosen to adopt convenient and well-known hypotheses without discussing their absolute truth. For example, I have used the term "diseases of the blood" merely because it associates a series of maladies in which there is an obvious common factor, although, of course, the precise nature of that factor is as yet only hypothetical.

CLASSIFICATION OF DISEASES.

I. *Diseases of the blood.*—These are manifested by blood-derangements or disorder of the system in general. The chief pathological affections included under this head are :—(1) *Anæmia*, mere poverty of blood, a condition in which there is a deficiency in the total quantity of blood or in the number of the red corpuscles. (2) *Chlorosis*, or green sickness, a peculiar form of anæmia occurring in young women. (3) *Pernicious anæmia*, a state of blood the cause of which is unknown, but which is associated with slow but steady impairment of all the vital powers, and invariably tends towards a fatal issue. (4) *Addison's disease*, or bronze discoloration of the skin, a condition usually accompanied by morbid changes in the suprarenal bodies. (5) *Hodgkin's disease*, or lymphadenoma. In this affection there is enlargement of the lymphatic glands, and gland-tissue is sometimes found in places where normally it is not present. (6) *Leukæmia* is an affection in which the number of red corpuscles is diminished, while that of the white corpuscles is absolutely and relatively increased. (7) *General dropsy*, where the albumen in the blood-serum is diminished. (8) *Scurvy;* this condition is due to insufficient supply of those materials in the blood which are needful for the requirements of proper assimilation. (9) *Purpura* is a condition of deranged blood; in it the capillaries are very apt to give way. (10) *Hæmophilia;* this state consists in the deficiency of fibrine in the blood, the capillary vessels being also abnormally weak, and offering but slight resistance to the passage of blood. The disease is nearly always hereditary.

II. Another grand division of diseases of the blood, or of its morbid conditions, embraces various local and general disorders. Local blood-diseases include (*a*) *uræmia* or accumulation of urea. (*b*) *diabetes*, in which there is an abnormal amount of sugar. (*c*) *cholæmia*, where there is excess of bile pigments. General diseases *e.g.* fevers, are known as (1) *zymotic diseases.* These are due to the introduction into the blood of a definite morbific matter derived from sources external to the body, the nature of that matter being as yet unknown; (2) *pyæmia* and *septicæmia* are also due to the absorption into the blood of a morbid agent, but they differ from zymotic diseases in that the poison spread through the system is derived from some unhealthy part of the body, such as a wounded surface, in which the morbid material has become implanted. In both these affections the blood is in a state of decomposition and also frequently contains some minute organisms (Bacteria); (3) *rheumatism* and *gout* are also classed as general diseases of the blood. In the latter the uric acid is in excess; in the former the *materies morbi* is supposed to be lactic acid. Diseases are again classified according to the different anatomical systems of the body, and they are designated as organic and functional. They are said to be *organic* when attended with change of structure in the part affected. The change may be in one or in all the tissues of an organ. One such alteration in the normal condition of an organ is known as inflammation, which may be acute, subacute, or chronic. Other structural changes are known as hypertrophy, atrophy, degenerations of various kinds, and morbid growths. In *functional* disorders there is no evident change of structure, although abnormality of action is observable.

In the study of medicine a thorough and comprehensive knowledge of various methods of investigating a disease is absolutely necessary. Its *causes* should be first ascertained. The power of detecting specific causes or morbid agents, which produce a disease, enables us to avert or prevent diseases, either by repelling or by destroying those agents. The application of this knowledge is known as prophylaxis. Another method of investigating a disease is afforded by a knowledge of symptoms and physical signs ; and this again paves the way for prognosis, diagnosis, and treatment. By a careful study of treatment we can in a majority of cases, by adopting appropriate measures, arrest diseases, diminish their severity, shorten their duration, promise a favorable termination, and prevent complications and sequelæ.

ETIOLOGY.

Etiology treats of the causes of diseases.

The cause may be *proximate* or *remote.* The *proximate* cause of disease is the morbid condition of any organ or structure upon which the symptoms depend. The *remote* cause is one which can be traced to conditions external to the body. The remote causes may be—*predisposing* or *exciting*. *Predisposing* are those conditions which render the system generally, or any one part of it, especially susceptible to disease. *Exciting* causes are those circumstances which call the existing tendencies into action.

The chief *predisposing* causes are—*Age.* Some diseases, as smallpox, may occur in the fœtus, and at any period of life to extreme old age. Others are confined to a particular epoch, while a larger number have a limited range through more than one period. A few examples may be given. Plastic vegetative endocarditis of the right side of the heart, or disease of the tricuspid valves, rarely occurs but in the *fœtus.* Disturbance of the stomach and bowels, as evidenced by vomiting and diarrhœa, is most common in infancy and childhood. The new-born child has a peculiar tetanus and a peculiar œdema. Rickets begins during lactation, and during the first two or three years of childhood.

Duchenne's paralysis (pseudo-hypertrophic paralysis), or progressive myosclerotic paralysis, has hitherto been observed in childhood ; eclampsia nutans during the same period. Intestinal worms are most common in children ; epileptiform convulsions, croup, and whooping-cough are disorders of the period of the first dentition. Chorea rarely occurs after puberty. The whole range of cancerous disorders are most common at the end of the middle period of life. Emphysema, angina pectoris, granular kidney, apoplexy, all belong to the same era. General paralysis is very rare much before thirty or much after forty. Prurigo and idiopathic gangrene, degeneration of vessels leading to rupture and hæmorrhages, and various other diseases connected with the decay and degeneration of tissues and organs, are diseases of the last period of life. Examples of diseases of wide but not absolutely of indefinite range are—gout, which may begin immediately after puberty, though never before it, and which extends to the last years of life; rheumatism, which occurs in children just able to walk, and thence onwards; and tubercle, which is most common from thirty to forty, but which may occur in the second year or at any other. Scrofula is very common in young persons.

2. *Sex.*—Besides the diseases of or relating to the sexual organs, statistics show that one sex is more prone to certain diseases than the other. Duchenne's paralysis (pseudo-hypertrophic muscular paralysis) occurs almost exclusively in boys. Hysteria, chlorosis, ulcer of the stomach, and exophthalmic goitre are common in females; croup and gout are common in males.

3. *Diathesis of the patient.*—A diathesis is characterised by local manifestations of groups of minor disorders and various symptoms affecting any one or several organs. It is a pathological expression implying certain diseased habits, or tendency thereto of the blood, tissues, or organs, in individuals in whom the disease may or may not have manifested itself. A diathesis, such as, for example, the syphilitic, gouty, tuberculous, cancerous, and Bright's diathesis, may be either inherited or acquired.

4. *Constitution of the patient.*—Many conditions predispose to diseases. Thus anæmia, whether congenital or acquired; plethora, as due to high living; a long neglected symptom, as cough; previous suffering from any acute disease; an habitual neglect of certain natural functions; the sudden suppression of an habitual discharge; the pre-existence of structural changes in any organ or tissue; any exhausting discharges, as hæmorrhages, fluxes; all these conditions tend to render the body peculiarly susceptible of various diseases.

5. *Idiosyncrasy of the patient.*—With certain individuals there is a special liability to suffer from certain agencies which are to most persons innocuous. The effect of emanations from hay in producing hay-asthma, is felt by a somewhat numerous class.

Certain articles of diet or certain medicines also act in an unusual manner upon some persons. Thus, quinine salivates a few, and in some persons opium acts as a strong purgative; even a grain of quinine has been known to produce boils on the fingers. A very small quantity of ipecacuanha produces very distressing symptoms in some individuals.

6. *Heredity or family history.*—Persons inherit from their parents

many physiological peculiarities. They resemble them in features to a greater or less extent, in mental capabilities, in habits of life, manners,&c. Pathologically considered, the morbid growths are developed *in utero.* Thus, abnormal structures or congenital malformations, as nævi, and inherited tendency to disease, as idiocy, are the most obvious instances of hereditary transmission. A similar tendency to morbid growths in a child born healthy may become manifest long after birth. Such a tendency dependent upon some less obvious but radical abnormality is the probable explanation of the distinct heredity of certain diseases. Certain functional nervous disorders, as insanity, epilepsy, asthma, neuralgia, hysteria, run in families. Gout, tuberculosis, syphilis, and cancer and skin disease, as psoriasis, follow an inherited tendency in them. The inherited tendency or the vitiated growth may not always give rise to precisely the same result. Thus the children of a lunatic may not be lunatic, but epileptic, or phthisical. The offspring of persons with goítre are cretins without goítre. The same disease may descend directly to some of the offspring of each sex, or to the offspring of one sex only, and in this case the latent tendency may be transmitted to the predisposed sex in a next generation. Thus, gout is transmitted as gout, but chiefly to male offspring. Hæmophilia is also inherited almost exclusively by males, though capable of transmission through unaffected females. That which is hereditary is strictly speaking what is acquired in the process of fertilisation of the ovum. That which is congenital is acquired during growth of the fœtus *e.g.* nævi, various malformations, &c. Thus, a mother may infect her offspring before birth with smallpox, and the child may be born with the disease, which is then properly described as congenital, and must be distinguished from what is hereditary.

7. *Occupation.*—Those working in white lead factories, as plumbers, type-founders, pewterers, and painters, often suffer from lead poisoning, as evidenced by colic and dropped wrists. The cotton sifters, furriers, flax-dressers, and workers in coal mines, wool sorters, and knife- and fork- grinders are subject to a peculiar form of general wasting due to lung disease caused by the chronic irritation of the bronchi set up by the fine hard dust of the materials on which they work.

Those who are engaged in writing continuously for long periods of time sometimes suffer from writers' cramp (Scriveners' Palsy). The wool-sorters exposed to the dust and fine short hairs rising from wool- suffer from chronic diseases of the lungs, as bronchitis and pulmonary consumption. They also suffer from a low form of pneumonia, due to poison resulting from decomposing animal matters contained in wool. Looking-glass makers (by the old process), thermometer makers, and other persons working with mercury, are liable to be poisoned by it. Makers of artificial flowers and coloured papers suffer from contact with arsenic, and exhibit external ulcerations and suffer from internal pains which might seem inexplicable if their occupation were not considered. Soldiers are peculiarly liable to aortic aneurism. Shoemakers, from their sedentary occupation, and probably also in a less degree from the pressure of the shoe-last, are often dyspeptic. Loud singers and preachers suffer from sore throat. Plethora affects butchers, though this is due of course to their diet rather than to their actual work. Cow-pock affects dairymen. The factory hands are anæmic. The occupation of the weaver and girls engaged in needlework is peculiarly liable to produce permanent pallid complexion, weakness of digestion, and anæmia.

8. *Habits of life.*—Individuals who habitually smoke tobacco, opium, bhang, gunjah, or chew tobacco very frequently, or daily use very hot condiments with their food, often suffer from indigestion and palpitation of heart. Similarly, habitual topers and gin drinkers are affected with renal disorders, with cirrhosis of the liver, and various degenerative changes, and with delirium tremens. Those who eat sumptuous dishes suffer from gout. Those of sedentary habits suffer from dyspepsia and from hepatic disorders. Highly nitrogenous food leads to uric acid diathesis. Venereal excesses, by debilitating the system, render it more prone to disease. Syphilis is a common cause of nervous diseases. It affects the bones of the skull and the membranes. The disease spreads gradually and interferes subsequently with the functions of the cortex and of the nerve-trunks at the base of the brain. It often gives rise to gummata, which are generally seated at the base, in the Sylvian fissure, or on the convexity. Syphilis also affects the coats of the cerebral arteries, which, owing to the deposit, become hard and narrowed in calibre.

9. *Effects of previous disease.*—An attack of smallpox is, except in a very small minority of cases, protective against any subsequent attacks of the same disease. Many maladies, as tonsillitis, rheumatism, and bronchial catarrh, have a tendency to recur. Other disorders, as gonorrhœa and syphilis, render the patient liable to an attack of acute rheumatism. Syphilis is a most potent cause of many nervous disorders and of various degenerative changes in tissues and organs. Smallpox and typhoid fever may be succeeded by tuberculosis. Chorea is regarded as a sequel of scarlet fever, but more especially of rheumatism. Paralysis of the pharynx often follows diphtheria. Chronic interstitial nephritis is often complicated with hypertrophy of the heart and with degeneration of vessels.

10. *Special predisposition of different organs and tissues.*—Different

diseases limit their attacks more or less exclusively to certain parts or tissues of the body. Parasites attack the skin and muscles, and also the larynx, heart, the brain, kidneys, and intestines. Those found in the spleen and liver are known as hydatids. Rheumatism and gout affect the fibrous tissues, such as the ligaments and soft parts about the joints. Tubercles are never found in the skin or muscles, or the connective tissue. Morbid growths, as cancer, are most frequently met with in the testicle and uterus, in the liver, stomach, and mammæ, and also in the larynx and œsophagus. Tubercles are most common in the respiratory organs, as the larynx, pleuræ, lungs, and occasionally in the heart. They are also found in the spleen and lymphatics. In diseases of the alimentary canal tubercles are sometimes found in the pharynx. In abdominal phthisis the liver, kidney, bladder, and the brain are not free from its attack.

11. *Influence of heat and cold.*—Continued exposure to a very high temperature, and especially when the body is fatigued, leads to fevers and to diseases of the brain and lungs, and in extreme cases even to death. In Europeans living within the tropics hepatitis and dysentery are common. Exposure to intense cold often leads to congestion and inflammation of the kidneys. Persons who put their heads out of the carriage windows when travelling by express trains, and thus expose themselves to the blasts of cold air, are liable to suffer from facial palsy. Exposure of the whole body or of any of its parts to intense cold, as of wet-sheet packing or of cold-bath treatment in cases of hyperpyrexia, if not systematically carried out and used in fit and proper cases, affects the general system by shock, or produces serious or fatal maladies, as congestion of both lungs. Exposure to draughts of cold air leads to catarrh of the mucous membranes, and in children to catarrh of the stomach or bowels. Rheumatism, bronchitis, and pneumonia are its most common effects. The average temperature of the human body during health is 98·4°, that of the blood being 100°. The temperature of the rectum is nearly 1° higher than under the tongue or in the axilla. During health it is elevated by external heat, exercise, and high living. It is also influenced by age, time of the day, and disease. In children and in the aged it is 1° higher than in adults. The temperature rises continuously from morning till evening, then it begins to fall, and is at its lowest towards midnight. In fevers it often rises as high as 105° or 106°. In morbus cæruleus and in cholera it falls to about 80°.

12. *Influence of the atmosphere.*—Individuals who breathe air contaminated with foul gases or mixed with particles of cotton or with wool dust, or with carbon or fragments of metals, as iron, lead, arsenic, &c., become subject to lung diseases. The constant

breathing of vitiated air in tropical countries, and the emanations in over-crowded and close rooms, lead to fever, diarrhœa, and dysentery.

13. *Variations of temperature.*—Nature has adapted the human frame to live healthily in all climates and at all seasons; but the effects of sudden variations of temperature, coupled with the neglect to adapt ourselves and our habits of life to the alterations of climate and season are the chief factors in the production of local inflammatory diseases. Thus, catarrh of the respiratory passages, as coryza or common cold, laryngeal catarrh, bronchial catarrh, catarrhal pneumonia, and pleuritis, often follow undue exposure to variation of temperature.

14. *Soil.*—Soil consists of animal, vegetable, and mineral matters mixed with air and water. The loose porous soils are healthy, because they are dry and are not impregnated with noxious effluvia from animal or vegetable putrefaction. Damp soil produces misty air, thus aiding the evolution of unhealthy vapours, whence arise diseases, as catarrh, consumption, rheumatism, and neuralgia. A moist soil also influences the development of malarious fevers, cholera, and dysentery. The rise and fall of river waters in India, by making the soil too moist or too dry, often cause periodical outbreaks of malaria. When an outflow is impeded the result is a universal prevalence of fevers. On the other hand, by attention to drainage operations, malarious places have been rendered quite healthy. Typhoid fever has been supposed to be connected with changes in moisture of the soil, and it was observed that when the ground-water was lowest the fever rapidly spread. For malarious fevers it is pretty clearly ascertained that there is some kind of decomposition or fermentation going on in the soil, which contains organic matters, and that this process is aided by heat, moisture, and limited access of air. Marshy soils, except those which are regularly overflowed by water, cause periodic fevers. Such soils contain a large percentage of water, a large amount of organic matter, and abundant vegetation, and their surface is flat with a slight drainage. Muddy soils in the vicinity of large streams, if occasionally covered with water, are highly malarious. The soils of valleys and nullahs, by containing large quantities of vegetable matters, and owing to the frequently narrow outlets, impede the overflow of rains, and are also malarious. The deleterious gases which result from the decomposition of vegetable matters in the sewers, when mixed with the air we breathe or the water we drink, become a source of many diseases.

15. *Intermarriages.*—Marriages among near relations, by intensifying inherited morbid tendencies and by preventing their eradi-

cation by healthy crosses, no doubt perpetuate hereditary diseases. The custom of marrying at an immature age, so prevalent in India, has, I am sure, a powerful influence for evil on the constitution, and tends to develop morbid conditions, which soon become hereditary, and might no doubt be carried so far as to cause the deterioration of the race.

16. *Race.*—In most cases it is difficult to distinguish the influence of race from simple heredity. But the liability to contract particular disorders and to die of them is much greater in some races than in others. Thus, the recent epidemic in Fiji showed that the constitution of the South Sea islanders was far less capable of resisting the effects of the poison of measles than is that of Europeans.

17. *Locality.*—Besides the obvious results due to a sheltered or an exposed region, of a place where the changes are sudden, or one where the temperatures are equable, particular conditions are undoubtedly to be found in particular localities. Certain morbid conditions (diseases) have a special predilection for certain localities and in the same locality for special seasons. Thus, within the tropics and in India diarrhœa and vomiting are most rife after the rains; the diseases of the respiratory passages during the months of October, November, December, and January. Dysentery, hepatic abscess, and ague, are all common diseases of the tropics. Hydatids of the liver and paroxysmal hæmaturia are much commoner in Iceland and Mauritius respectively than anywhere else. Stone in the bladder is more common in Guzerat than in other parts of India, and in Norfolk than in the other counties of England.

Exciting causes are—(*a*) *food.*—Unwholesome food, too uniform a diet, excess, too little food, irregular hours of meals, or insufficient mastication, are frequent causes of disease. Milk is said to contain all the aliments necessary to maintain human life in its most perfect state. It contains nitrogenous matters, as casein, albumen, &c.; carbonaceous, as fat, oil, and sugar, in the form of lactin; and water and salts. In any given diet there ought to be foods of each group in order to maintain perfect nutrition. Thus, we take *nitrogenous* elements in flesh and vegetables; the *starchy* and *saccharine* compounds, which contain a large proportion of carbon, in vegetables; *oleaginous* substances, which also contain abundance of carbon, in animal and vegetable food; and, lastly, *saline compounds* and *water.* Besides those substances, which are absolutely necessary for the maintenance of health, there are others which enter into many diets, such as the various condiments which give taste to food or excite secretion, and flavoured drinks, such as tea and coffee.

The quantity of food requisite for healthy men of average height in India, between 5 ft. 6 in. and 5 ft. 9 in. and average weight between 1¾ and 2½ maunds, in moderate work, is estimated at about twenty ounces of water-free food, or about fifty ounces of ordinary food, as the latter always contains about 60 per cent of water. With this quantity of food about sixty ounces of water is also taken daily in some liquid form. The amount of food varies with each individual, with differences of exertion, and with differences of climate. Those doing laborious work take more food than men in quietude, and those in cold seasons and in cold countries more than those exposed to high temperatures. Good and sufficient diet is a powerful agent in the prevention and cure of disease.

1. *Excess of food.*—Too much food. General disorders, disease, as gout, and even shortening of life, are common in cases of habitual excess in eating and drinking. Food, when taken in excess, even though it may be fairly wholesome, is not absorbed; it undergoes putrefactive changes in the alimentary canal and quantities of gas are formed. Dyspepsia, and diarrhœa, and other forms of gastric and intestinal disturbance are thus produced. In cases where the putrid matters are absorbed, fever, torpor, and congestion of the liver are not unfrequent results.

As a rule, living should be plain, simple, and in accordance with the dictates of nature. We should avoid excess of what is pleasurable, as the refinements of the art of cooking lead to over-indulgence in food. The evil which results from the excess of vegetable and starchy food is obesity. The excess of animal food, coupled with sedentary habits, leads to gout. In this affection the nitrogenous products of disintegration are not oxidised and metamorphosed, and thus discharged, as they would be were exercise taken freely. These accumulate in the system and are retained, and various disorders result, such as oppressed stomach, deranged digestion, vitiated secretions, torpid liver, sluggish brain, disturbed sleep, and high coloured urine with deposits or sediments.

2. *Unwholesome food.*—Various kinds of fish, when taken as food, lead to convulsions. Diarrhœa is very common among the poor in India, who partake very freely of putrid fish and meat. The adulteration practised in various kinds of grain used by the people as their staple food, as well as the use of grains in a partial state of putrefaction, leads to colic and vomiting.

Each kind of food can be advantageously digested, or even digested at all, only in a certain amount varying with the kind. Thus more meat may be usefully digested than starch, and more starch than fat. Fat when taken in large quantities passes unchanged through the bowels. When excess of food, particularly of animal food, is taken continuously a general state of plethora is induced. If exercise be not taken at the same time there is imperfect oxidation of food, and therefore retention of constituents unchanged, giving rise to irritation of the skin or of the kidneys. Excess of albuminates without other food leads to fever and diarrhœa, and if persevered in, albumen appears in the urine. Excess of starches and of fats delays metamorphoses of the tissues and produces excess of fat. Sometimes it produces acidity and flatulence. When taken in excess much passes into the fæces, and the urine may become saccharine.

3. *Deficiency of food.*—Deficiency of special and essential ingredients in food, insufficiency of sustenance or privation, is a fruitful source of many diseases. Cases are common where the patient is feeble and wanting in strength owing to the fact that the food taken has been insufficient in quantity or inferior in quality. The deficiency of food gives rise to emaciation, debility, caseous degeneration, and in cases where the essential ingredients, as potash, are deficient, scurvy is the result.

The effects produced by famine in India are too well known. Deprivation of albuminates, without lessening of other kinds of food, produces deleterious effects after some time. On the other hand, a diet consisting of pure albumen cannot be adopted for any length of time without producing serious symptoms. Fat is essential, and many diseases of malnutrition are successfully treated by the exhibition of fat in some form or other, a fact which shows that deprivation of it is more serious than is commonly supposed.

The usual length of time that life continues under complete abstinence from food and drink may be estimated from eight to ten days. Exposure to cold in conjunction with starvation hastens the advent of death. In the absence of food life can be prolonged by water; in starvation the distress from thirst is greater than that from hunger.

4. *Irregular time of eating.*—For the proper maintenance of health and vigour it is necessary that the food should be taken with regularity and at proper periods. In the Zoological Gardens in London the lions and tigers are fed once a day at 4.30 p.m. only, and this habit keeps them active and lively. Some classes of natives in India are satisfied with one meal a day, and with them in proportion to the length of interval is the amount of food consumed at one time. In those whose mode of existence entails upon them a habit of eating at irregular intervals, and whose supply of food is precarious and irregular, gluttonous habits and inability for bodily or mental work are frequent results. The prevailing custom, and that adopted by instinct for the requirements of mankind, is three meals a day, to be taken at intervals of about six hours. It is sup-

posed that an ordinary meal is digested in about four hours, and then the stomach is allowed time for repose before the next meal is ingested into it. It is important that we should breakfast without much delay after rising in the morning. For this purpose a light meal is conducive to health and vigour. Another meal, and a more substantial one, should follow in the middle of the day, or at one or two in the afternoon. The third meal should be taken at six or seven in the evening. Many business or professional men err in omitting to eat at a time during the day when the system requires it, or if they eat at all they taste only a biscuit or two till evening. With them the whole system becomes disordered: in the evening they appear exhausted and careworn. After their evening meal they feel drowsy and uncomfortable, their digestive powers being unequal to the demand made upon them fail to act vigorously, and evidence of disordered action begins to show itself. They often become dyspeptic.

(*b*) *Beverages and Condiments.*—Beverages: alcoholic drinks when taken in small quantities improve appetite and increase the activity of the circulation. In disease their effects on the brain and general system are well known. When taken in large quantity they affect the nervous system generally, impair appetite, lessen muscular strength, and promote degenerations. The average quantity that can be taken in twenty-four hours with impunity may be estimated to be from half to one ounce of pure alcohol imbibed in some diluted form. In women a less quantity will suffice. In children it is badly borne, and highly injurious. It has no doubt been statistically proved that intemperance has caused a vast loss of health and life. At the present day total abstainers and those who use alcohol moderately are known to enjoy the highest health, longest life, and greatest vigour of mind and body. Although man can do without it in health, there are morbid conditions in which it is most useful, and instances can no doubt be found in which large quantities have been taken throughout very long lives. In great cold and in great heat alcohol is absolutely injurious. It is forbidden on Arctic sledge parties. The common notion that alcohol is necessary in India and in the tropics is a mischievous delusion, and more cases of dysentery and liver complaints among the Europeans occur from this than from any other cause. Waterton, the famous traveller in the tropical regions of South America, who never touched alcohol, and who died from an accident when eighty-three, is an example of entire abstinence from alcohol, associated with excellent health and life in the tropics, without injury to the constitution.

In cases of great exhaustion of the nervous system alcohol revives the mind greatly by augmenting the circulation in the brain. The nervous tissue thus receives more nutriment, and therefore must work more strongly for the time. In cases where there is want of food alcohol has a sustaining force, and is said to act by keeping up the action of the heart and deadening the susceptibility of nerves. Of all beverages beer, when taken in moderation, is well adapted to aid digestion and to lessen elimination of fat; it thus increases the weight of the body by promoting assimilation and lessening metamorphosis. Alcohol when taken in excess or at frequent intervals, either strong or only diluted slightly with water, or on an empty stomach, or as an adulterated stuff, always does harm. Brandy being an unfermented beverage is suitable for some dyspeptics. Wine or alcohol when taken in moderation and with a principal meal may be beneficial in stimulating the gastric glands and promoting digestion. Water in moderation is necessary for digestion. As a substitute for large quantities of water during the early stage of primary digestion, warm soup may be taken with advantage at the commencement of a meal. During a later stage the dilution of the food may be accomplished by draughts of weak tea. Experiments have proved that water is often the means of conveying poison and other substances into the system; thus the poisons of noxious gases, metals, ova of worms, and even specific poisons, are conveyed through this agent.

(*c*) *Condiments.*—The food of many poor Hindoos, and especially of the working classes, chiefly consists of bread (starch) and chutney, made of chillies and other condiments mixed with various spices. The result of such diet is that they generally begin to get weak-sighted at an early age. Those of the middle classes who use spices too largely with their food frequently suffer from dysentery and from violent straining, with burning pain in the rectum. These condiments may be supposed to have a *local irritant* action on the mucous membrane of the large intestine. In a few cases they affect the urinary tract and strangury results. In India such condiments as chillies, cayenne pepper, and pickles, are best borne by people living in cold climates. Such condiments are an essential and useful part of the diet of the mountaineers. From the hills their use has descended to the inhabitants of the hotter plains, who need them only as an occasional luxury, and are injured by their extensive consumption.

(*d*) *Insufficiency of clothing.*—It is a fertile source of many chest diseases. Persons who are insufficiently clad, and who expose their skin to the draughts of cold air, and those who allow their clothes to remain over the skin in a wet state for a long time, are liable to suffer from diseases of the lungs.

(*e*) *Exercise.*—Any undue exercise of either the body or the mind, great mental anxiety, disturbed sleep, any violent emotions, and the neglect of physical exercise, and abuse of the system, all tend to produce debility and other nervous diseases.

Other exciting causes are known as specific causes of disease. These are (1) Mechanical (2) Chemical.

Mechanical causes.—These may originate within the system, or be introduced from without. Among the former class may be mentioned obstruction of hepatic, renal, or other ducts or tubes, or of their orifices, by inflammatory thickening, by pressure of tumours from without the organ, or by calculi, as in the gall-bladder. Other causes of a like kind are obstructions in the air-passages, urinary passages, in the cardiac orifices and in the blood-vessels. Emboli in the blood-vessels, leading to obstruction to free circulation of the blood, dilatation of cavities, perforation and rupture of vessels, extravasation of blood or of serum, as in apoplectic clots, are mechanical causes of local diseases. Intestinal worms, calculi in the bladder, retained fæces, any foreign or irritating substances in the air-passages, as particles of dust, cotton, iron, &c., all favour the development of diseases. Other mechanical causes which affect the system from without are external violence, injuries, blows, or falls, &c.

(2) Chemical specific causes are introduced from without and include various mineral acids and alkalies. These destroy the mucous surface with which they come in contact. Other poisonous substances of this class are arsenic, mercury, lead, and phosphorus ; it also includes vegetable poisons, as aconite, opium, strychnia, and animal poisons, as snake poison, poison from rabid animals, &c. All these poisons undergo absorption, and when introduced into the blood variously affect the human frame or only particular organs. Some of these poisons are introduced habitually and in small quantities, and induce changes after a time. Thus, alcohol, opium, tobacco, after habitual use, give rise to various ill-effects. Similarly intestinal colic is the result of lead poisoning, and muscular tremors are due to the excessive use of mercury. Others are very quick in their action, as strychnia, which gives rise to violent convulsions, and opium, to extreme coma. Phosphorus leads to necrosis of the jaws. The snake poison produces lividity of the surface and suppression of various secretions. Other specific causes are those which originate within the system or depend upon defective action or suppression of various excretory functions, and consequent retention of effete products in the blood. The skin, kidneys, liver, and lungs are the chief excretory organs employed by nature for the purification of the blood. Where the functions of the kidneys are in abeyance the urinary constituents accumulate in the blood and lead to uræmic intoxication. In disordered hepatic

function the bile is suppressed or absorbed after being secreted, and jaundice results. When, from any cause, the blood is poisoned, or there is any foreign body interfering with healthy respiration, the venous blood circulates in the body and leads to cold extremities, lividity of the surface and delirium and coma. These symptoms are well exemplified in cholera and snake-bite, and in regurgitant cardiac disorders. Other chemical agents are certain unknown poisons which lead to various specific febrile disorders. There are various other diseases whose causes are not clearly known. They differ from those already mentioned. These are described as contagious or infectious diseases. The cause is specific for each disease. Some of these contagia are living organisms, and as such may belong either to the vegetable or to the animal kingdom. They can readily pass from affected persons to others in sound health, and their tendency is to grow and multiply in the body and produce similar and characteristic symptoms. The animal parasites exist in the skin and the alimentary mucous membrane. Some of them are also found in the parenchyma of organs. These are capable of transmission in an indirect way; they at first undergo various transformations either external to the body or in the organism of some lower animals; very often through the dejections they infect other healthy persons. There are various specific causes which, like those of scarlet fever or syphilis, are inherently infectious and spread by direct contact (inoculation) or through the atmosphere.

SYMPTOMATOLOGY.

Symptomatology or semiology includes *symptoms* and *physical signs* of disease. A *symptom* has reference to the patient's own description of his feelings and sensations in a given case, or to effects perceptible by the observer. A *physical sign* refers to the knowledge we gather by our own senses.

The symptoms are classified into:

(*a*) *General* or *local.* General, as they refer to the whole system; or local, only to a particular part. (*b*) *Subjective* or *objective.* Objective, as evident to the senses of the observer, as vomiting, cough, hurried breathing; subjective, as felt only by the patient, as pain, distress, or morbid sensations of some kind. (*c*) *Direct* or *sympathetic.* Direct, when they point directly to the diseased part; *sympathetic*, when to some part remote from the seat of disease. (*d*) *Premonitory*, when they present themselves before the development of a disease and indicate what is to happen. (*e*)

Pathognomonic. These are characteristic symptoms which assist in establishing the diagnosis of any particular disease.

Physical signs are those conditions which are evident to the senses of the observer, or elicited only by an examination of the body.

In order to facilitate the study of symptoms and physical signs a short summary of them has been arranged and given as an introduction in the following pages.

A knowledge of symptoms, both subjective and objective, in every case, is essential for a correct diagnosis. This can best be assisted by clinical observations or the bedside examination of patients with reference to physical signs. Post-mortem examination by verifying or falsifying the diagnosis greatly assists the minute study of disease. A knowledge of the past experience of others, as acquired by extensive study of books and attendance on lectures, will materially assist in the thorough investigation and correct appreciation of any and every case. There are certain symptoms which are common to almost every disease. These relate to the general condition of the body, to the temperature, to the state of the pulse, tongue and skin.

Symptoms which relate to the *state of nourishment or general condition of the body.* Under this head may be considered:

(1) *Obesity* denotes the general overgrowth of the fatty tissue. The patient is dull and indisposed for active exertion, the belly is penduious and flabby, and the muscles are soft. In the male the breasts often hang down, and are very big and doughy. In these patients fatty degeneration is a common condition.

(2) *Great emaciation* suggests a chronic disease, or that there has been a high temperature for some time in an acute attack.

(3) *Decubitus, posture and movements* of the body or of its members. In the coma-vigil of typhus, for example, the patient lies prostrate on his back with eyes wide open, not sleeping, yet insensible to all around. In some diseases of the eye, or acute cerebral diseases, the posture is such as to avoid light. In a few spinal or cerebro-spinal diseases, in tetanus, and in poisoning by strychnia the position is most startling. The spine is arched (opisthotonos or emprosthotonos) and the body supported at each end only. In aortic diseases, and in advanced heart disease of other kinds the patient leans forwards. In various pulmonary affections the posture is one of sitting, with head propped up by pillows and the patient panting for breath; or he may be lying on either the affected side or the sound side. In exhausting diseases and just before death the patient lies on his back, is restless and tends to sink down towards the bottom of the bed. In acute rheumatism there

is as complete quiescence of the muscular system as the patient can attain. In the cold stage of ague the patient covers himself up with all the clothing at his command. *Movements of the body.* In cases of general debility, in paralysis of the extremities, in rheumatism of the joints, or in injuries of the spine or brain, the patient is unable to rise in bed. In colic and other abdominal affections he lies with his knees drawn up, in peritonitis on his back, in pleurisy or pneumonia, on one side. In pleurisy the patient lies at first on the healthy side, and subsequently on the affected side. In disorder of the liver and in cases of enlargement of the heart the decubitus is dextral. The rickety child throws off the clothes and lies with its limbs exposed.

(4) *Countenance or face.*—In *anæmia* there is an extremely emaciated face, pale and bloodless condition of the skin and also of the mucous membrane of the lips and eyes. In collapse from intermittent fevers, in extreme exhaustion from profuse hæmorrhage, or from profuse discharges, as in cholera, the face is very thin and the eyes deeply sunken, cheeks hollow, skin pale with a leaden hue, eyelids apart, temples hollow, and the nose peaked and prominent, forming what is called *facies Hippocratica.* Hippocrates described such a face as a sign that death had actually taken place. It often indicates death or its approach, but it may also occur in states from which recovery is possible. In *chlorosis* there is a greenish hue coexisting with pallor. Yellowness is characteristic of jaundice; bronze discoloration, of Addison's disease. Strabismus occurs in nervous disorders; dilated alæ nasi, in diseases affecting respiration. In *diabetes* the skin of the face is pale and bloated, the skin generally and also the lips are dry and harsh, and the cheeks are sallow. In *cancer*, especially in the advanced stages, the face is waxy or straw-coloured and cachectic-looking, and there is emaciation. In *acute rheumatism* it is usually full and perspiring. The sclerotic is abnormally white, pupils dilated, and the lips of a bright red colour. In *typhoid fever*, the face is clear with a bright flush on the cheeks. In the second week, or at a later period, there is a dull and vacant expression of face. In *typhus* fever the expression is dull and heavy, the face dusky looking, and the conjunctivæ injected. In *mania* and *hydrophobia* the expression is wild and fierce as in rage. In *melancholia*, it is desponding. In *idiocy* or *dementia* a vacant look and a purposeless smile are usually present. In *delirium tremens* there is an expression of terror. The patient looks suspicious, and the movements of his facial muscles are rapid and expressive, as if he were talking with his whole face and not only with his lips. In *hypochondriasis* there is a sad and desponding expression. In *epilepsy*

a purplish face immediately precedes the convulsion, and distortion and rolling inwards of the eyeballs take place during the fit. Epileptics generally have a dull expression. In *hysteria* the face is distorted during the fit, but natural during the interval. The eyeballs are often prominent. The pupils are dilated, the conjunctivæ bright, the eyelids tremulous. In *hemiplegia* the face is distorted by being drawn by the unaffected muscles towards the sound side, and there is ptosis. Cyanotic face occurs in *chronic bronchitis.* In *emphysema* the lips may be blue and the face dusky, owing to persistent obstruction to the pulmonary circulation. In *pneumonia* there is occasionally a vesicular eruption on the lips, the cheek of the affected side is flushed and the lips are dusky. In *pleurisy* with large effusion, and in *empyema* the lividity is most marked. During paroxysms of *whooping cough,* and in the cold stage of *ague*, the lividity of the face is sometimes very marked. In *phthisis* the face is wasted, has prominent cheek bones and a hectic flush. In *dyspnœa* the aspect of the face is expressive of great distress. In *pleurisy* with effusion, and in *empyema* and in *acute tuberculosis*, lividity denotes imperfect aeration of blood and accumulation in the right ventricle. *Cyanosis* is a characteristic feature in congenital malformations of the heart with obstruction at the orifice of the pulmonary artery. In abdominal disorders, as *acute peritonitis*, and in *pericarditis* the expression is extremely anxious. In *morbus cœruleus* the whole of the face looks purple. In *organic heart disease,* the face is pale at first, but after a time the capillaries of the cheek become injected and prominent, and later on, the face may grow bloated and purplish, and there is also dyspnœa and œdema. In *chronic Bright's disease* (large white kidney), and in some cases of acute albuminuria the skin of the face is pallid, puffy or bloated, and pasty, and the sclerotic is pearly white and watery. In *exophthalmic goitre* the face is staring, the eyeballs prominent, and the expression wild and excited.

Symptoms relating to temperature.

The normal temperature of the body is 98·4°, slight variations, however, exist within certain limits without interfering with health. Thus the temperature is at its maximum, or 99°, between 4 and 6 p.m., and at its minimum, or at 98° or 97°, about two hours after midnight. The difference between the morning minimum and the evening maximum is generally 1°. Any rise above 99·5° denotes fever. In some diseases the temperature is depressed below the normal standard. Many acute and chronic diseases exist which during their course are unattended with any rise of temperature.

In fever the daily course of temperature varies. In mild and moderate cases the temperature rises towards evening, and falls in the early morning. In severe cases the temperature often remains persistently high at all hours. In children during disease the temperature is generally and relatively higher than in adults. The increase of temperature also varies with the intensity or activity of the disease. In acute specific fevers and in acute inflammatory diseases, the rise of temperature is proportionately great. An abnormal temperature denotes general weakness, and is accompanied by the frequent pulse, loss of appetite and delirium. It depresses and weakens all the bodily functions, and produces degeneration of many internal organs. It is thus an exact measure of the patient's danger. In those already weak and debilitated, as by previous illness, by intemperance, or excesses of any kind, or by inattention to hygienic laws, a high temperature is of a much more serious import than in persons previously healthy.

The course the temperature runs assists greatly in making diagnosis. Thus, in ague and pyæmia the temperature is characteristic. In ague the temperature of the blood and internal organs is often as high as 103° or 104°, although the patient may be complaining of intense cold or a feeling of chilliness. The temperature is elevated in acute specific or infectious diseases, in acute inflammation of some organ, in acute rheumatism or gout. It is also raised in cases where the fever assumes a chronic form, as in chronic and deep-seated abscesses and in consumption. In pernicious anæmia and in cases of leucocythæmia the temperature is also somewhat raised.

The mode of the rise of temperature.—At the onset the rise may be sudden and rapid, or gradual. Its character in this respect helps in the diagnosis of the disease; a sudden and rapid rise denotes acute inflammation, as pneumonia, typhus fever, scarlet fever, measles, and erysipelas. In these affections the temperature reaches its highest point in twelve or twenty-four hours. It is generally accompanied by chills or rigors, or by a single rigor. In other affections the elevation of temperature is gradual, and takes three or four days before it reaches its maximum. This happens in tuberculosis, in typhoid fever, and sometimes in pleurisy.

The course the temperature runs.—From the temperature chart we learn the height of the thermometer, the extent of the daily variations, and the number of days the fever lasts. A very high temperature with slight daily variation threatens considerable danger. A temperature of 105° if persistent always marks a severe and serious illness. With a temperature of 107° recoveries are rare. A temperature of 110° is very quickly fatal. In German measles the temperature seldom rises higher than 100° or 101°.

In measles, scarlet fever, and in cases of typhoid fever, the temperature reaches 103°. In puerperal fever it ranges between 104° and 105°. In the condition known as sunstroke the temperature may reach 109° or 110°. An enormous elevation of temperature has been noticed in tetanus and after injury of the cervical medulla and in certain spinal diseases.

Duration of the fever.—If the temperature is very high and the daily variations slight, the attack is severe and may last for many days. In typhoid fever, if during the second week the daily variations are great, the probability is that the fever will end on the fifteenth or the twentieth day. Where the daily variations are slight the fever will probably last a long time or over thirty days. The fall of temperature in the morning after it had remained persistently high for a long time, shows the commencement of the decline of the attack. In acute inflammations, in eruptive fevers, the temperature usually falls between the fifth or tenth day. In typhus the duration is fourteen or fifteen days. In typhoid fever the fever seldom goes beyond thirty days. In tuberculosis and in chronic fevers due to chronic abscesses (internal) the duration is a matter of uncertainty.

Extent of the variations.—A sudden rise of temperature forebodes some complication. A sudden fall indicates either a natural termination of the attack (in pneumonia it is common for the temperature to fall from 105° to 98°, or 97° within twelve hours) or a sudden collapse. In typhoid fever the sudden fall of temperature means hæmorrhage into the bowels or perforation of the intestine. In relapsing fever, the fall of temperature is very great and sudden, a difference of 7° or 8° being noted in as many hours.

In cases of disease the temperature is usually taken in the axilla, occasionally in the rectum or vagina. In the latter situations the temperature is from $\frac{2}{5}$ to $\frac{4}{5}$ of a degree higher than in the axilla, the maximum being more rapidly attained. The thermometer must remain in the axilla for fifteen to twenty minutes in order to obtain a true reading, or the patient may be directed to close the axilla some minutes before the thermometer is introduced. It may then be suffered to remain for five minutes when the maximum will be reached. It must be remembered that exercise and food cause the temperature to rise, to the extent of a degree or even a little more.

Symptoms relating to the state of the pulse.

The state of the pulse is a very valuable aid in the treatment and diagnosis of disease. It furnishes diagnostic symptoms of particular diseases and signs whereby we infer important pathological conditions involved in different affections. It often affords a conclusive proof that recovery or death will follow. It indicates the advisability or otherwise of a stimulant plan of treatment. It is a guide giving early indication of the approach of prostration. It depends on the heart and varies with the condition of that organ. It is also influenced by the condition of the vessels, according as they are dilated or contracted, or their walls atheromatous or fibrous. The pulse is imperceptible at the wrist in cases where the heart ceases to beat. The arrest of the heart's action may be direct, as in paralysis of the heart, as occurs in fevers where the body is consumed, or indirect, the depressing effect being due to another system. (The brain or the lungs.)

Variations in the pulse beats.—These may be classified as (1) frequent or infrequent; (2) slow or quick; (3) small or large; (4) compressible (soft) or incompressible (hard); (5) regular or irregular; (6) intermittent. During health the frequency, size and compressibility of the pulse vary very considerably in different individuals. The variations are connected with the age, sex, and individual peculiarities. In infants the pulse is 120 or 130 per minute. It diminishes as age advances, and at twenty-one years it is on the average 70 or 75 per minute. In females it is from five to ten beats more than in males. In advanced age it is greater than in the middle life. It is often noticed at 90 or 100 in healthy adults. With some, under the influence of very little excitement the pulse becomes accelerated to 120 or 140 or more. In some persons in perfect health and strength the pulse is very small and compressible.

Pulse in disease.—During health a variety of transient causes give rise to the frequency of the pulse. The pulse increases about eight or ten beats after food is taken and especially after spirits. Posture has a great influence in accelerating the pulse. It is less frequent in the sitting than in the standing, and still less in the recumbent posture. It is greatly accelerated in fever, general debility, physical or mental excitement, hysteria, and in cardiac disease. In fever, the frequency is in proportion to the rise of temperature, though the ratio varies in different fevers. Thus in scarlet fever the pulse is quicker than in the typhoid with the same temperature. In cardiac weakness the pulse is very frequent, but the temperature is not high in proportion. A pulse of 120 denotes high fever, above 120 shows cardiac weakness and is much more serious; a pulse of 140 or 150 denotes danger, and if it continues at this rate death is inevitable. In acute rheumatism the pulse of 120 without any cardiac complication indicates great danger. If it rises to 130 the patient will surely die of prostration. In acute rheumatism with pericarditis the frequency of pulse even to 140 or 150 in a minute is far less serious, even though the pulse may be small and very compressible. In mitral disease the pulse is frequent and also irregular. In chronic diseases it is also frequent and shows cardiac weakness. A frequent pulse, when due to cardiac weakness, is almost always associated with diminished arterial tension and becomes therefore soft and compressible. A frequent pulse becomes small and compressible in cases where the heart becomes still more weak, and the condition is therefore more dangerous. In chronic diseases, as phthisis, a persistently frequent pulse indicates the degree of constitutional disturbance, telling heavily upon the powers of life. In nervous people a visit from a physician increases the number of pulse beats. In exophthalmic goitre the pulse is 110 or 120, though there may be no fever. Diminished frequency of the pulse is common in cerebral diseases, and chiefly in cerebral congestion, cerebral apoplexy, in serous effusions and exudation of lymph. During convalescence from fevers and other acute affections the frequency is also diminished. In pneumonia it falls almost to a normal point within twelve hours. In hepatic colic, in jaundice (cholæmia) the pulse is about 60 in a minute. Digitalis, aconite, and various antipyretics have the power of diminishing the frequency of the pulse far below the normal state. In some healthy persons a pulse of 40 or 50 beats in a minute is a normal peculiarity.

Intermittent pulse.—It is a condition in which a beat is occasionally missed. The omission may be frequent or unfrequent, and at equal or unequal intervals. With some an intermittent pulse exists throughout life. It may be habitual owing to idiosyncrasy, or may be caused by certain articles of food, etc., as tea, fish, tobacco. An intermittent pulse is not of serious import unless associated with heart disease.

Irregular pulse.—In this condition there are a series of regular beats, followed at short intervals by a series of beats with more rapid succession. This variation occurs in nervous subjects. Another form of irregularity of the pulse is when the beats lack uniformity in force. This occurs in cases of pulmonary obstruction as in pneumonia, pleurisy, pulmonary œdema, hydrothorax. In another variety of irregular pulse the beats are unequal in volume and force. Its character is best marked by a noticeable change in length, force, and character. It exists in mitral disease, in fatty degeneration of the heart, in acute meningitis, and in acute fevers, especially during prostration, or a few hours before death. In children with tubercular meningitis the pulse is often irregular. Aconite when given repeatedly, almost every half hour, has often been known to produce irregular pulse. In some cases of aneurism of the aorta the pulse is not felt at the two wrists at precisely the same moment. The course of the blood is checked in the artery of the side towards which the aneurism lies.

Dicrotic or double pulse.—This variety depends on the condition of the blood-vessels. These undergo relaxation and the arterial tension is diminished. It is frequently met with in typhus fever. In exhausted individuals very slight fever will cause a dicrotic pulse. *Hard and cord-like pulse.* Hard pulse depends upon high arterial tension. It is also small and incompressible, and may be rapid or slow. It occurs in the rigors of fevers, in cirrhotic kidney, in gout, in blood-poisoning, as by lead, ergot, or gallic acid, and in degeneration or atheroma of vessels. In tubercular meningitis and in capillary bronchitis the pulse is small and thread-like, even though the child be prostrate.

Modifications of the pulse during stages of an acute illness.—In fevers during the chill or rigor the pulse is of high arterial tension. It is frequent, small, and hard. During the febrile excitement the pulse becomes large, full, and bounding. At this stage if the patient grows weak, the pulse becomes soft and compressible, short or quick and dicrotous. In cases of fever with great prostration the pulse is very frequent, small, and easily compressible. During the decline of the fever, which is generally accompanied by free sweating, the pulse is very soft, large, and easily compressible and dicrotous. In non-febrile diseases and in acute rheumatism attended with sweating, the pulse is large, soft, and compressible. In aortic regurgitation the pulse gives a sharp, quick stroke, yielding the impression as if a shot were suddenly puffed under the finger. The pulse is often visible and most conspicuous in the arteries in the neck (carotid) as far as the back of the ear, and also in the radial artery. In the radial it is seen on raising the arm. In aortic obstruction the pulse is slow, small, infrequent, and often hard. In mitral obstruction the pulse may be irregular or small and compressible. In arterial degeneration the pulse is hard to the touch, the artery is tortuous and elongated, and sometimes hard plates may be felt in it at the wrist. *Recurrent pulsation.* In this condition, after completely compressing the radial artery with the finger, a pulsation can be felt on the distal side. This is found in persons with relaxed arteries, and mostly in women. In a state of collapse, as in epidemic cholera, the pulse gradually becomes weaker and smaller. During syncope, and in cases of profuse hæmorrhage, the pulse becomes exceedingly small and even extinct.

Symptoms connected with the state of the Tongue.

The symptoms presented by the tongue are very important in consequence of the great number of diseases in which they afford valuable indications. It is important to decide, however, in any given case, whether the appearances presented are due to local diseases of the tongue or mouth, or are the expression of disorder in other organs. As a general rule, there is no difficulty in coming to a conclusion on this point.

As an index of disorder of other organs or of the system generally, the tongue may undergo alteration as regards its size, colour, state of moisture, temperature, and the condition of its epithelium.

The size of the tongue may be increased or diminished. When enlarged it presents indentations on its sides, these are due to the pressure of the teeth. It is often at the same time flabby and relaxed. This condition is sometimes one of the first signs of the action of mercury upon the system. A small contracted tongue indicates anæmia. The volume of the organ is also diminished in fever, owing to loss of water. In glossitis from an injury, the tongue becomes enormously swollen. The colour of the tongue varies exceedingly. In plethora and gastric congestion it is generally red and florid. In cases of disease in which there is insufficient oxygenation of the blood, the tongue, like the lips and mucous membranes generally, is livid or purple. In cases of anæmia the tongue is pale and often small.

The condition of the tongue as regards dryness also varies exceedingly. Normally the tongue is moist, but there should be no excess of saliva present. It is important to notice that a dry tongue in the morning is often found in persons who sleep with the mouth open. Under such circumstances the tongue readily becomes moist after closing the mouth and moving the organ about, so as to excite a flow of saliva. Dryness in disease may exist in different degrees, from mere clamminess to perfect dryness. It depends on a deficiency of saliva, or of mucus, or of both, and indicates a febrile condition or a general tendency to diminished secretion. Alcohol, opium, and belladonna all cause dryness of the tongue. An opposite condition is induced by mercury, by the vegetable bitters, and by nitric acid. In aged persons the tongue readily becomes dry in many non-febrile conditions. It is necessary that a really dry tongue should not be mistaken for a moist one, in consequence of the patient having recently taken some fluid.

The temperature of the tongue serves as a guide to that of the body generally. When decidedly cold to the touch, it indicates great prostration. A cold tongue is a frequent symptom in the collapse-stage of cholera. Abnormal heat of the tongue may be due to inflammation of the organ or of some part of the mouth, or to some febrile movement of a general character.

An important point in connection with the state of the tongue is the condition of its epithelium. This in the normal state is almost of the same colour as the substance of the organ and is scarcely distinguishable, except perhaps towards the base where it is usually light in colour and somewhat thick. When the epithelial layer is plainly visible and different in colour from the body of the organ, the tongue is said to be furred. The "fur" consists of mucus and epithelium; the former is readily removable, but the latter adheres more or less firmly to the surface. Some persons have habitually a furred tongue in the morning, before breakfast; like dryness, it may be caused by sleeping with the mouth open. A furred tongue is an almost constant symptom of fever. In the acute stages it is generally white, thickish, and tolerably uniform. Later on it becomes discoloured, patchy, short, and perhaps scanty, allowing the red colour of the organ to appear through it. In miasmatic fevers and bilious disorders, the fur is often yellow, and is accompanied by a bitter taste in the mouth. A brown and black tongue, with a perfectly dry surface, is seen in the last stages of adynamic fevers. It is then very often fissured and covered in places with patches of blood and hardened mucus, the same appearances being presented by the gums. In scarlet fever the tongue is covered with a white fur through which the red tips of the papillæ protrude. This has been called the "strawberry tongue." A furred tongue, without fever, is a common sign of dyspepsia. The condition is also induced by smoking, excess in alcohol, opium, and other drugs which check secretion.

It is important to notice the way in which a furred tongue becomes clean. Under favorable circumstances, the fur slowly disappears from the tip and edges, and these parts look moist and healthy. The root of the tongue is the last part to become clean. In other cases the fur separates in flakes, which leave a smooth, red, glossy surface exposed. This is often seen in typhoid fever. In such cases convalescence is often tedious. Sometimes the fur recurs, and this may happen several times. In unfavorable cases, after the fur has separated, the tongue becomes dry and parched, and presents cracks and fissures. In diabetes the tongue is often very dry, smooth, glazed, and like a piece of raw dry beef.

In some cases taste is lost or depraved. This symptom generally depends on gastric or local causes, but it is sometimes due to cranial lesion causing paralysis of the nerves of taste.

The movements of the tongue are somewhat often affected in disease. In fevers the tongue is tremulous and often protruded with difficulty, and sometimes when protruded the patient shows no inclination to withdraw it. In hemiplegia the tongue is protruded towards the paralysed side. In glosso-laryngeal paralysis articulation is embarrassed, the tongue can scarcely be moved in any direction and at last lies quite motionless in the mouth, chewing and swallowing being then impracticable.

Symptoms connected with the Skin and Nails.

The skin is an extremely complicated organism, consisting of epidermis with the hair and nails, the papillary and reticular layers of the cutis, the subcutaneous connective tissue, and the sebaceous and sudoriferous glands. Any one of these constituents is liable to morbid processes, such as inflammation, growths, hypertrophy, atrophy ; or to mechanical derangements, as congestion, œdema, &c. Various alterations take place in the skin in specific febrile diseases. The skin has three important functions to perform—1. Sensation ; 2. Secretion ; and 3. Excretion. It also serves as a protective covering to internal parts.

During health the skin is soft, elastic, and somewhat glossy ; in disease the condition of the skin changes. It may become dry, moist, profusely wet, or sodden. In fever with persistently high temperature it is pungently hot and dry. In many cases of diabetes and Bright's disease it is very dry and harsh. In exhausting febrile diseases, as in phthisis, it is covered with moisture. The occurrence of sweating shows weakness, and a fall of temperature in exhausting febrile conditions. During shiverings of ague the skin is dry like a goose-skin. The occurrence of profuse sweating without fever indicates general weakness. In a depressed state of health very slight exertion causes free perspiration. In children affected with rickets even sleep produces profuse sweating. Persons long resident in a hot climate find that the skin often perspires freely, especially on exertion, for some time after a return to colder latitudes. Free sweating is characteristic of a sudden fall of temperature in fever ; it also occurs after a rigor, as in pyæmia, and also in phthisis. In phthisis the temperature is less in the morning and at that hour the patient sweats freely. In fever the sweating occurs only once daily. In general weakness it may break out many times a day, and is especially apt to occur after exertion or during sleep.

In convalescence from scarlet fever the sweating is profuse and lasts longer than in other specific fevers. Hence in scarlet fever sudamina appear in crops.

In acute rheumatism there is profuse acid sweat. Profuse sweat at the commencement of specific fevers, when the temperature remains high, shows extreme weakness. In extreme prostration, as in cholera, the skin and the sweat are cold and clammy. In acute inflammations as pneumonia, the skin is hot, dry, and harsh, without any soft supple feel. In the desquamative stage of scarlet fever, and to a much greater degree in ichthyosis, it is rough and scaly.

Wasting of cutaneous fat occurs in most chronic diseases, in fevers, and in some of the more prolonged acute affections, as diarrhœa, dysentery. In acute miliary tuberculosis there is rapid wasting which is chiefly owing to the very high fever which accompanies it. Emaciation is also a marked symptom in caseous pneumonia.

Odour.—In acute rheumatism the odour is acid and disagreeable, and like that of a sour poultice. During the maturation of smallpox pustules the smell is peculiarly disagreeable. In typhus fever there is characteristic mousy odour. In measles the perspiration has a peculiar odour said to resemble that of a freshly-picked goose. In scarlet fever it is like mouldy cheese.

The colour of the skin is yellow in jaundice, in bilious and yellow fevers. Pale and sallow in anæmia, chlorosis, cancer, albuminuria, and syncope. Purple, or blue, or dusky, in low continued fevers, morbus cœruleus, and collapse stage of cholera. Cyanosis is due to one or both of these causes, incomplete oxidation of blood in the lungs and passive congestion in the capillaries and veins. A red colour of the skin of the ear on one side of the face after food is characteristic of dyspepsia. Bronze colour occurs in diseases of the suprarenal capsules (Addison's disease). Redness of the skin, with burning, round the margins of the palms of the hands and soles of the feet indicates indigestion or hectic fever.

The skin of the face is flushed in fever, and in congestion of the brain. It is purple or livid in low fevers, sallow in chlorosis, dyspepsia, and cancer, and almost black in asphyxia from any cause.

Œdema of the skin.—In kidney-diseases and in advanced cases of heart-disease the skin is generally œdematous, that is, fluid accumulates in the subcutaneous areolar tissue. The skin becomes pale, tense, and shining. Pressure with the finger leaves a more or less deep depression. In local inflammations, œdema occurs in the neighbourhood of the inflamed parts. In passive dropsy the feet may swell at night but the swelling has usually subsided on leaving the bed by morning; or does so after lying for some time in the horizontal posture with the feet raised. The œdema of renal disease usually appears first in the face, especially in the lower eyelids. Dropsy of a local character is generally dependent upon the formation of coagula or thrombi in the veins. The skin has a peculiar marble-like feel in sclerema and in morphœa.

Subcutaneous emphysema is due to the accumulation of air within the meshes of the subcutaneous tissue. The skin pits on pressure, but not so deeply as in œdema. There is a feeling of crackling or crepitation on pressing the inflated parts. Emphysema may extend over the whole body. It is generally caused by internal or external injury of organs which contain air. The most common causes are wounds of the chest involving the lung. Pneumothorax is first developed, and the air finds its way through the wound in the costal pleura into the areolar tissue. Emphysema may also be caused by rupture of air-cells by over distension, the air being forced into the subcutaneous tissue of the neck. This variety is sometimes met with in croup, whooping-cough, and bronchitis, and in pulmonary emphysema.

Scars, besides indicating wounds or burns, or the result of application of caustics, may be due to rupia, smallpox, or chicken-pox. The scars of chicken-pox and smallpox are best seen on the face; of rupia on the back. Marks of leech-bites, of phlebotomy, and of cupping may be of importance in the history of the case. Marks of vaccination should be looked for, and the scars of strumous abscesses are of particular importance; they are most common in the neck. Scars are also left after ulcers, boils, carbuncles, and some cutaneous manifestations of syphilis. The production of a scar depends upon the depth and character of the inflammation. Its presence indicates destruction of the true skin which is replaced by cicatricial tissue. The fibrous tissue on contracting leaves a pit or depressed white mark.

Maculæ or stains are due to pigmentary deposits in the tissue of the cutis. The discoloration does not fade on pressure. May be secondary to syphilis, pregnancy, Addison's disease, or leprosy. They are sometimes due to long use of nitrate of silver or of iodine, to excess of bile, or of acids in the stomach, or to existence of parasites or fungus-elements; may be due to hæmorrhagic diathesis, as in purpura, to exanthemata or rash. The stains are superficial red patches, variously figured and diffused over the body, leaving interstices of healthy-coloured skin, and terminating generally in exfoliations; *e.g.* freckles and moles.

Ulceration.—It is the result of inflammation in cachectic, strumous, or syphilitic subjects, or of morbid growths replacing the normal tissues and undergoing softening and decay. Cancer is the best example.

Excoriation is a mere exposure of the true skin without any removal, and is due to the irritation of scratching or rubbing. When in the bends of forearms and thighs these excoriations suggest scabies, and when about the shoulders phthiriasis.

Eruptions on the skin.—During specific fevers a patch of eruption or a single spot appears. In smallpox the eruption passes through the papular, vesicular, and pustular stages, and finally crusts form and become detached. In the case of scarlet fever and measles the eruptions are slightly elevated and fade on pressure. In nettle-rash, roseola, erythema, and erysipelas, a rash is the prominent symptom. Itching of the skin occurs in pruritus, urticaria and scarlatina. In scarlatina and in measles the layers of the cuticle separate, and desquamation results, and the skin is rough and scaly. In many cases the cutis becomes raised in the form of minute blisters, which when small are known as vesicles, and when large as bullæ. These vesicles contain clear fluid, or fluid which may be turbid or mixed with blood. Sudamina are small, clear vesicles, due to obstruction of the ducts of the sweat-glands and to excessive secretion. They are found in many febrile conditions, pneumonia, rheumatism, &c. Other vesicular eruptions are eczema and herpes. Ecthyma and impetigo belong to the pustular form. These and other forms of diseases of the skin will be described in a special chapter.

Symptoms relating to diseases of the blood.

Under the head of Diseases of the Blood I have endeavoured to group together diseases due to alterations in the quantity and quality of blood, and to the presence of certain excrementitious principles and other matters in the blood. These never occur as independent affections, but as an accompaniment or consequence of other diseases.

Simple anæmia.—It occurs in many chronic diseases, as phthisis, cancerous diseases, scrofula, chronic pleurisy, chronic affections of the liver and spleen, Bright's disease, syphilis, &c. The morbid condition is due to any of these and similar grave disorders. In it the face, ears, and lips are extremely pale or bloodless, the conjunctivæ also pallid, the fat in the subcutaneous areolar tissue may be almost wanting. The subcutaneous cellular tissue is œdematous owing to serous effusion, and hence there is often œdema of the feet, headache is constant or recurrent. Pain in the left side of the chest under the left false ribs is common, and the slightest exertion brings on fatigue. There is a sense of weight and muscular pain on any exertion. The hands and feet are generally cold. The patient complains of hectic accessions of fever, of want of appetite, of palpitation of the heart, and of dyspnœa. The urine is limpid and passed frequently, its specific gravity is generally low owing to its containing a very small quantity of urea. Such patients have a marked venous hum in the neck, and a hæmic or systolic bellows murmur. The latter is heard in the carotid artery, at the base of the heart, over the subclavian and the pulmonary artery, and over the aorta. If the blood be examined it is found to be poor in cellular elements, its serum is deficient in albumen, the quantity of its salts being increased.

Chlorosis.—The word signifies green sickness. In this affection the complexion has a more or less greenish tint, other symptoms being similar to those found in simple anæmia, with this difference that in chlorosis the patient may be fat. There is no subcutaneous cellular œdema of hands and feet. The disease is met with exclusively in young girls and women, and occurs chiefly at the period of puberty. It is most common in girls in whom menstruation appears in the eleventh or twelfth years, or before the development of the breasts and external organs of generation. It is thus mostly connected with menstrual disorders, an occurrence very common at that period. The menstrual flow is often diminished or suppressed, or it may be profuse. It is often encouraged by bad air, sedentary habits, masturbation, and various unhealthy modes of life. Such patients often have a peculiar craving for clay, slate, and such other indigestible articles. If the blood be examined it is found to be deficient in the number of its cellular elements. In some cases 1000 parts of blood may contain only 50 or 60 parts of blood-cells instead of 130 parts. The serum, albumen, and salts are normal.

Pernicious anæmia.—This blood disease is idiopathic and always fatal, and hence distinguished from simple anæmia which is always a symptom incidental to various grave disorders. This disease is marked by its slow and progressive character; the vital functions and the muscular powers gradually become more and more impaired, till at last, within a period varying from six to eight months, they reach the lowest ebb. It is most frequent in females, and is apt to occur during pregnancy or after confinement. Bad nourishment, repeated hæmorrhages, over-lactation, chronic discharges, all are supposed to lead to it. When the disease is established the face appears œdematous, and there may be general dropsy. The skin as well as the mucous membrane is pale and bloodless. The patient complains of extreme debility, and a tendency to faintness, and suffers from palpitation of the heart, and dyspnœa on the least exertion. The appetite is impaired, vomiting is very common. Throughout the disease there is no fever. The liver or spleen is not enlarged. As the case progresses prostration becomes more marked. The pulse is very frequent, small, and easily compressible. The anæmic murmurs are distinct, and late in the disease hæmorrhages from the mucous surface as well as petechiæ are often observed. Ophthalmoscope shows reddish spots in the region of the optic papillæ. In this disorder the body does not emaciate, although the nutrition may be greatly impaired. An examination of the blood shows marked diminution in the size and number of red corpuscles, the white corpuscles not being increased in proportion.

Lymphatic anæmia.—Hodgkin's disease. The affection is also known as lymphadenoma or adenoid disease. The disease is generally fatal within two years. In this disorder the patient suffers from a group of symptoms similar to those of simple anæmia, namely, progressive debility, and emaciation. Hæmorrhage from the mucous surfaces is common, chiefly from the nostrils or mouth. Sometimes there is slight fever. He also suffers from enlargement of the lymphatic glands (the cervical glands, the inguinal, axillary and mesenteric). These slowly increase in size, and some of them also undergo fatty or cheesy degeneration. They often suppurate and discharge a milky fluid. The liver and spleen are also enlarged. Other symptoms are due to pressure of the enlarged glands upon their neighbouring parts. Thus, the pressure upon the trachea or bronchia may cause death by suffocation. Pressure on the par vagum, or on the recurrent laryngeal nerve, may result in aphonia and embarrassed breathing; pressure on the inferior vena cava may cause œdema of the feet and lower limbs.

In this disease the lymphatic growths are found in situations where glands are not normally present. It mostly occurs in males, and generally between ten and thirty years.

Leucocythæmia or leukæmia.—Like the rest of blood-diseases, leucocythæmia is characterised by marked anæmia and often ends fatally. In this affection the morbid process consists of excess of white corpuscles or leucocytes in the blood. The increase in the number of white corpuscles is due to their multiplication, and to the fact that the number of red corpuscles is notably diminished and anæmia results. During health the proportion of the white to the red corpuscles is 1 to 335, although the normal proportion varies to a slight extent during the act of digestion, in pregnancy, &c. As a symptom, incidental to many diseases, this condition is only temporary. In marked cases the proportion varies. In a majority of cases it ranges as low as 1 to 7. In most cases of leucocythæmia, as a symptom of minor importance, there is enlargement of the lymphatic glands, with or without swelling of the liver and spleen. In splenic leucocythæmia the spleen is alone enlarged. The affection is known as lymphatic leucocythæmia, where only the lymphatic glands are affected. Cases of enlargement of both the spleen and lymphatic glands are also met with, and are known as spleno-lymphatic leucocythæmia. Other symptoms depend upon the enlarged spleen, and lymphatic glands pressing on the neighbouring parts. Thus the enlarged spleen causes pain and a sense of fulness in the left side under the left false ribs. The enlarged bronchial glands obstruct breathing and may cause death by suffocation. The pressure of enlarged glands on venous trunks leads to œdema and dropsy. In such cases hæmorrhage from the mucous tracts is common.

Anasarca or general dropsy.—This affection is different from a local serous effusion confined to a single cavity. Anasarca is a serous transudation into the meshes of the areolar tissue. It may be due to changes in the blood or to obstruction affecting the entire venous circulation. When due to blood-changes, dropsy is a symptom of anæmia; there is more or less œdema of the face, limbs, and trunk. The swelling pits on pressure and remains for some time after the pressure is removed. In advanced cases the effusion may extend into the serous cavities, and give rise to ascites or hydrothorax and other similar local dropsy. In a majority of cases, where anasarca exists, it is due to renal disease, and is then called renal dropsy. It may also be due to disease of the heart, and is then distinguished as cardiac dropsy. As a sequel of malarial fevers anasarca also occurs.

Pyæmia and septicæmia.—Pyæmia is an affection characterised by metastatic abscesses appearing especially in the lungs and liver, and also in other organs. It is supposed to be due to a kind of infectious poisonous agent called bacteria, certain minute vegetable organisms, transported from parts which are the seat of morbid processes. It follows surgical operations or local injuries, and is connected with other morbid processes, as decomposed blood, puerperal state, suppuration, ulceration, &c.

Pyæmia.—The symptoms follow injury or supervene upon local diseases. It begins with a chill or rigors, this is followed by fever and sweating, the temperature rising to 104° or 105°. After a few hours the fever disappears. Recurrences of chills followed by fever usually occur. The patient gradually becomes prostrated, and in acute cases dies in two or three weeks. In chronic cases abscesses make their appearance in different parts beneath the skin and internally. The joints also become inflamed and swollen.

Septicæmia.—In this affection the poison does not manifest its action by producing metastatic abscesses. As in pyæmia there is some previous history of morbid processes, as suppuration, ulceration, &c., or of the puerperal state. After delivery some infective material gains access to the cavity of the womb, perhaps fragments of the placenta are left behind, and these decompose and act as septic matter. The patient suddenly becomes feverish, sometimes without any premonitory chill. The temperature may rise as high as 106°. The febrile symptoms either remain continuous or are characterised by slight remissions. In this affection prostration is extreme, the tongue becomes dry and brown; diarrhœa and yellowness of the conjunctivæ are constant symptoms. The patient gradually becomes delirious, and dies usually within a week. In mild cases recovery follows.

Scurvy, purpura hæmorrhagica and hæmophilia.—In all these blood-affections there are occasionally minute ecchymoses in the skin (petechiæ). In scurvy, owing to the deteriorated condition of blood, the standard of health is much lowered, there is indisposition to work, extreme debility, great mental depression, and pain in the limbs and joints. The gums are swollen and fungous, they are often ulcerated and bleed on the slightest touch, and the teeth lie loose in their sockets. The breath is peculiarly offensive. Where ecchymoses appear on the skin, they form large patches of effused blood. Extravasations of blood also take place between the muscles, giving them a livid appearance. Bleeding from the mucous surfaces usually occurs. In some cases the lower limbs become œdematous and dark-coloured from infiltration of blood. Defective alimentation has much causal connection with this affection.

Purpura hæmorrhagica.—The condition of the gums, which are soft, livid, and spongy, and bleed on slightest touch in scurvy, is wanting in this affection. The infiltration of blood beneath the skin and between muscles, also common in scurvy, is a rare phenomenon in this complaint. In this the capillary blood-vessels, and not the condition of blood, are at fault. In the majority of cases the subjects are young. Petechiæ and hæmorrhage from the mucous surfaces are the most marked symptoms.

Hæmophilia denotes a congenital hæmorrhagic diathesis. In a majority of cases the condition is inherited. It mostly affects males. It is rare after forty. The characteristic symptom is a constant and continued oozing of blood following any trifling injury, such as a minute puncture from a needle, the extraction of a tooth, or slight abrasion of the skin, or the mucous membrane. The hæmorrhage ultimately leads to marked anæmia, and sometimes ends in death. In some cases spontaneous hæmorrhage takes place from the mucous surfaces as the gums, nostrils, stomach, intestines, or urethra.

Other morbid conditions of the blood are due to the presence of excrementitious products. These include biliary and urinary secretions.

Cholæmia.—Bile is useful, both as a secretion and excretion. As a secretion it is useful in digestion within the intestinal canal. As an excretion it appears in the dejections. In bilious vomiting bile is supposed to regurgitate into the stomach. Its presence in excess in the stools may be due to a deficient absorption from the intestinal canal. Absence of characteristic colour and abundance of fat in the dejections show that bile is wanting or defectively secreted. In obstruction of the bile-ducts there is hepatic colic and associated jaundice. The stools are white and contain fat, and the urine is dark and full of bile-acids. Cephalalgia is also a marked symptom in cases of retention in the blood of the constituents of bile.

Uræmia.—In this condition there is retention in the blood of the urinary excretory product known as urea. The vicarious elimination of urea by the gastro-intestinal mucous membrane gives rise to vomiting and purging (diarrhœa). Vomiting occurs even though the stomach is empty. It sometimes occurs in the morning soon after rising from bed. The vomiting is sudden, and the vomited matter smells of ammonia, which indicates its origin. These symptoms precede the graver effects. The grave symptoms refer to disturbance of the brain, and include headache, defective sight, muscular twitchings, and drowsiness. The pain in the head is referred to the forehead or the vertex, or it is persistent and spread over the whole head. The loss of vision is generally sudden and complete. There may be amaurosis, and certain abnormal appearances in the retina as revealed by the ophthalmoscope. Dyspnœa often occurs and is independent of any lung mischief. The paroxysms generally occur during sleep, the patient is aroused by a sense of suffocation and is afraid to sleep again; coma and convulsions are two notable and grave symptoms of uræmia. These are often followed by active delirium, œdema of the lungs, and various inflammatory disorders of serous membranes. Coma is not sudden, as a rule it is preceded by drowsiness. Sudden coma occurs in apoplexy, less often in uræmia. In uræmia it is accompanied by epileptiform convulsions which continue for a long time with remissions and intermissions, until death is the result. In uræmic coma evidence of kidney disease, as albumen in the urine and a low specific gravity of this secretion, always exists. Absence of hemiplegia, which generally accompanies coma due to cerebral hæmorrhage, excludes brain-affection. In coma due to poisoning by opium the pupils are contracted, whereas in uræmic coma they are generally dilated.

Symptoms connected with derangement of the lymphatics.

The derangements of the lymphatic system include those of the lymphatic vessels and glands. Their affections are met with in the course of diseases originating in other parts. When they exist the whole system is generally affected.

Inflammation of the lymphatics.—It may occur as a primary disorder, and may then be due to direct injury, or may be secondary to some local inflammation, or the consequence of some irritant acting through the blood. In whichever way the inflammation is set up, the morbid products are conveyed by the lymphatics to the glands. These vessels may form red bands and become thick and vascular, or sometimes abscesses form in them. In a majority of cases inflammation is confined to the glands, and they then become soft and swollen, and give rise to large abscesses. In a few cases the inflammation assumes a chronic form, and the glands become indurated and enlarged, and ultimately contracted and atrophied. The condition is characterised by pain, heat, and redness of the parts, and is associated with febrile phenomena. The fever is generally attended with rigors.

In scrofulous subjects the enlargement of the glands is of common occurrence. In them the progress is extremely slow. The glands generally undergo caseous degeneration and ultimately form opaque, friable, paste-like masses. These invariably soften and suppurate. In rare cases they become converted into mortar-like *débris.* The skin or the mucous membrane covering them generally ulcerates and a sinus is left which discharges putty-like matter. The glands so affected are rarely painful or tender. The suppuration is often long delayed. When the cavity heals the scar left is depressed and ragged. The existence of such a scar in the neck of young girls is characteristic of scrofula with general debility and constitutional weakness. We find similar enlargement of glands, especially those which lie nearest the seat of morbid growths, as cancer or any other primary disease, as syphilis. These glands form large tumours. The only constitutional derangement resulting in such cases is fever and cachexia due to the primary disorder. The glandular enlargement in syphilis is peculiar, inasmuch as in one class of cases suppuration is common and constitutional symptoms are absent. In another class, suppuration rarely occurs, the glands become slowly and painlessly enlarged, and constitutional symptoms develop themselves. The enlargement of the glands continues for an indefinite period, often for many years. Lymphadenoma has been already alluded to.

Symptoms connected with disorders of the organs of locomotion.

They include rheumatism (articular and muscular), rheumatoid arthritis, gout, rickets, and mollities ossium.

Rheumatism.—It is an inflammatory affection of the fibrous and muscular tissues of the joints and other parts. It depends upon some general or constitutional disorder, and the attack has a tendency to migrate from one part to another. Symptoms vary according as the complaint is either limited to certain tissues or joints or organs, or becomes a general disorder. Where the disease is limited to certain tissues it is invariably chronic and intractable. It affects fibrous structures, as soles of the feet; muscles, as of the lumbar region in lumbago; nerves, as in sciatica. As a general disorder it is known as rheumatic fever. There may possibly be chills, attended with elevation of temperature and other severe febrile phenomena, upon which in a few hours other local symptoms supervene. In a few cases there may be at first slight flying pains, limited to some joints, or muscle or fibrous expansion, followed by fever and other acute symptoms. In this disease the joints chiefly affected are the large joints. They become extremely stiff, sore, swollen, and painful, even the touch of the bed-clothes causes great pain; the pain increases on movement. Superficial inflammatory congestion in some of these joints leads to their swelling. Thus the joints which are least thickly covered, as the knees and wrists, are tender and swollen. In rheumatism the tendency is to attack joints successively, and for the attack to last for a very short time. There is no pitting nor desquamation. Where several joints are implicated, some present earliest indications of inflammation, others have attained their highest point, while others are in a state of recovery. The joint once affected is liable to recurrences. Temperature.—The rise of temperature is another characteristic symptom. It is sometimes higher than the normal by one or two degrees, often it ranges between 102° and 103°, rarely it is above 105°. In fatal cases it may rise to 108° or 110°. Rigors are sometimes present. The skin is generally bathed in sour-smelling perspiration. The sweating lasts for a very long time. The pulse is frequent, but regular, often it is full and bounding. The respirations are hurried. The tongue thickly furred all over, or brown, or dry and fissured. The bowels are constipated. The urine scanty, high coloured, acid, and contains abundance of urates and crystals of uric acid; the chlorides are deficient. The patient is generally restless and sleepless, and looks depressed and anxious.

Besides the joints, the fibrous structure of the heart is also especially liable to be implicated in this complaint.

Symptoms relating to rheumatoid arthritis.

Rheumatoid arthritis, otherwise known as arthritis deformans, is a chronic inflammatory affection of joints, attended with deformities. In many respects it resembles rheumatism. In a majority of cases the joints of the fingers are affected, the thumb generally escaping. The disease extends to the smaller joints. Pain is the local manifestation, and is gradually followed by stiffness, soreness, and enlargement of the ends of bones and of the joints affected. Movement gives a crepitating feel in the diseased joints. The swelling is not confined to the joints, but is also due to nodular growths around them. The tendons become rigid, and the soft parts atrophied. As a result, deformity, dislocation, and loss of mobility follow, the fingers appear deflected laterally and in an outward direction. Where the large joints are affected the limbs become short and distorted. The disease may affect the spinal column and its various divisions, and lead to rigidity and curvature. There is tendency to the implication of most or of all the joints of the body. The disease is associated with anæmia. The affection is progressive.

Symptoms relating to chronic rheumatism.

Chronic rheumatism is a constitutional disorder due to a peculiar diathesis (rheumatic). It is a chronic inflammation of the joints, characterised by the absence of deformities, as in rheumatoid arthritis, and by the absence of suppuration or much effusion in the joints. It is not a febrile disease; occurs generally as a sequel of acute rheumatism. Though not a purely local disorder, several points are simultaneously or successively affected. The diseased joints are swollen and painful. They are tender to the touch and painful on any movement. It is characteristic of this affection that the affected joints are most painful in the morning on leaving the bed. The stiffness and soreness generally diminish after exercise. The disease persists for a very long time in the affected joints. Another characteristic is that the symptoms do not shift from joint to joint as occurs in acute rheumatism. Pericarditis or endocarditis is rarely met with as a complication. Any change in the atmosphere soon tells upon chronic rheumatic patients. The general health is for the most part good, but much depends in this respect upon the surroundings of the patient. If in good circumstances the condition may be one of little suffering, but among the poor chronic rheumatism is often a serious and unfortunately a very common complaint.

Symptoms relating to gout.

Gout is a constitutional disorder, often hereditary, and is marked by diseased condition of joints, chiefly of the metatarso-phalangeal articulation of one of the great toes. The disease subsequently extends to other joints. It leads to a deposit of the urate of soda within and around the affected joints. The blood contains excess of uric acid. Before the disease shows itself the patient generally suffers from malaise or other disorder. The disease occurs in paroxysms. Acute attack sets in suddenly at midnight with a severe pain in the great toe (often) of the left foot. The pain is excruciating, and followed by fever, and lasts for several hours. The fever abates with more or less sweating. The joint is highly inflamed, its superficial veins enlarged, and there is some œdema of the areolar tissue. Similar paroxysms set in on several consecutive nights, when the disease becomes mild and gradually disappears. When improvement takes place the skin over the affected joints desquamates. Recurrences are extremely common in gout. Some escape it for weeks, months, or years, in the intervals perhaps enjoying good health.

A modified form of gout known as an imperfectly developed or subacute attack is common. It mostly affects persons who have suffered from acute attacks, and chiefly occurs during the intervals. In them the joints become painful and somewhat swollen; these symptoms are attended with slight fever.

Deposits of urate of soda in the cartilages of the external ear are frequently found. Urine is deficient in uric acid, which is found in excess in the blood. Lead-poisoning or lead-colic very often leads to this disorder.

Chronic gout.—Patients suffering from repeated attacks of acute gout sooner or later become subjects of chronic gout. The local manifestations of the disease are to be traced in the small joints. The joints are more or less tender, swollen, and painful; the deposit of urate of soda around the joints is characteristic. The swellings around them are soft to the touch, and if these are opened, as when ulcerated, a semi-solid chalky matter escapes. The swellings after a time become hard and nodulated in cases where the contents are not discharged. The deposits are known as tophi, and when numerous and large produce stiffness, dislocations, anchylosis, and other deformities. Gouty patients are generally dyspeptic. They are also subject to mental depression and irritability. Gouty kidney is a common complication. Palpitation and other functional cardiac disorders commonly supervene.

Disordered state of muscles.—Myalgia is a painful condition of muscles, the pain being increased by movement but generally relieved by firm pressure. The pain is never continuous. It is often localised in a muscle or a group of muscles. It sometimes leaves one muscle and appears in another. *Varieties.—Torticollis* (myalgia cervicalis) otherwise known as stiff-neck. *Pleurodynia.* (myalgia pectoralis) occurs in the pectoralis and intercostal muscles. *Lumbago* (myalgia lumbalis). This affection involves muscles of both sides of the lumbar region.

Progressive muscular atrophy.—A gradually progressive increase of weakness of a muscle or of a group of muscles with evident emaciation. There is no pain. Muscles of one hand or shoulder, or of the neck, are generally the first to be affected. They lose their contour, and become flat or depressed in places where before they were prominent. Their function becomes also impaired or lost. The atrophied muscle, when smartly tapped, displays a sort of fibrillary twitching. The excitability of the sensory muscular nerve under the induced current is gradually diminished, and the current fails to induce contraction when the muscle is entirely atrophied. Every muscle in the body is liable to become thus affected, except the heart, bladder, and intestines.

Symptoms relating to rickets.

Rickets or rachitis is a disease of childhood. It is characterised by softening of the bones, enlargement of the ends of long bones, beady swellings of the ribs at their junction with the costal cartilages, enlargement of the liver and spleen, and a peculiar formation of the chest. The disease is mostly known by its effects on the osseous system; the ends of long bones become enlarged and thickened; they also become soft and liable to break, giving rise to a condition known as green-stick fracture. Such children have narrow shoulders owing to the shortening of the clavicles. The natural curvature of the spine is exaggerated, and hence the back becomes bent and twisted, the lumbar region presents a concavity forwards. The chest is considerably modified, the transverse diameter is very much diminished, while the antero-posterior measurement is increased; the sternum is thrown forwards and the ribs sink in laterally. The pelvis also presents great deformity. The bones become flattened and expanded, the sacrum thrown forward so that the cavity is contracted. In infants the head is large, the fontanelles are slow to close, and the forehead projects. The teeth are late in appearing; they rapidly decay. The patient is cachectic. Any slight exposure to cold brings on catarrh of the nasal passages. Such patients are subject to catarrhal affections of the stomach and intestines. The chief and characteristic symptoms are: 1. Fever with extreme restlessness. 2. Intolerance of the bed-clothes. 3. Profuse sweats, chiefly confined to the forehead and chest. 4. General soreness of the whole body with unwillingness, or fear, to move or be moved. In connection with these symptoms the appetite fails, the bowels are irregular, the urine is copious and contains abundance of phosphates and excess of lactic acid. The child wastes, is extremely anæmic and pallid. The liver and spleen being enlarged the abdomen is often ascitic. In fatal cases death is due to asthenia or to complications, as diseases of the lungs. Such children also die from laryngismus stridulus, convulsions, and chronic hydrocephalus.

Mollities ossium.—Rickets is a disease which occurs in children. This affection, on the other hand, occurs in adults and chiefly in women who have borne children. The bones, previously normal, become soft owing to the lime-salts becoming dissolved and absorbed. The condition is difficult to account for; the idea that the solution is caused by the presence of an acid has no foundation in fact. All the bones are liable to become affected, and all kinds and forms of distortions occur. Pains in the bones are generally the first symptom. The limbs gradually become weak and yielding, and the legs are unable to support the body, and become distorted and deformed. Copious sediments of phosphate of lime are found in the urine. The general health is variously affected; sometimes the muscles appear to be well nourished. The disease is a progressive one; no cure has ever been reported.

Symptoms connected with derangements of the ductless glands.

Thyroid body.—The affection of the thyroid body is known as goitre or bronchocele. Goitre is an hypertrophy of the thyroid body. As a temporary affection it sometimes occurs in women at their menstrual period and during pregnancy. It also exists as a congenital affection. In some districts, as Derbyshire, Hampshire, and Yorkshire, goitre is extremely common. It is more prevalent in women than in men. Drinking water, which abounds in various saline ingredients, as sulphate and carbonate of lime, is said to originate the complaint. If in such localities, other infectious agents preponderate, as malarial germs, the disposition becomes stronger and more energetic. The tumour is sometimes hard and resisting; in other cases it is soft and elastic. If the blood-vessels are enlarged there may be pulsation resembling that of an aneurysm. The growth resembles in form the healthy gland, or it may be unsymmetrical; the right lobe may develop more than the left. The growth occupies the lower and anterior part of the neck, and is in front of the trachea. The tumour follows the movements of the trachea, it causes great inconvenience by its bulk and weight. Its pressure on the œsophagus or trachea, on the brachial plexus, on the pneumogastric or recurrent laryngeal nerve, on the trunk of the sympathetic and on large veins in its neighbourhood, may lead to very serious consequences. In ordinary cases the pressure is slight, the patient breathes quietly when at rest; during excitement or during physical exertion, the breathing becomes somewhat difficult; in severe cases there is sooner or later danger of death by suffocation.

Disease of the suprarenal capsules.—The affection is known as Addison's disease. It is a chronic inflammation or tubercular infiltration of the suprarenal bodies, giving rise to a series of symptoms, viz. general pigmentation in the rete mucosum, and a progressive form of asthenia, ultimately ending in death. The skin of patients suffering from Addison's disease resembles that of a mulatto, it is dark brown or bronze-like. Parts of the body which are most exposed are more discoloured than others which are generally covered with clothes. Thus, the face, neck, and hands present more discoloration than the chest and limbs. The axilla, groins, the external genitals and areolæ of the nipples, are deeply pigmented. Similar brown discolorations are found on the tongue, gums, and inside the cheeks. Another characteristic symptom is the marked debility without any loss of flesh or emaciation. Any little exertion puts the patient out of breath, and he suffers from palpitation of the heart. The appetite is impaired and he is often dyspeptic. Languor and pain in the loins or pain or discomfort in the hepatic region is commonly complained of. Gradually as the disease progresses prostration increases, the hands and feet become cold. Towards the close the breath and skin emit a very offensive odour. Diarrhœa and convulsions are occasional symptoms. Death occurs from asthenia or from repeated attacks of faintness. The debility induced by this disease is very much like that which attends diabetes mellitus.

Spleen.—Disorders of the spleen of common occurrence are congestion, hypertrophy, inflammation, and degenerations.

Congestion.—Congestion of spleen is a normal condition during digestion; as a disorder it is mostly met with in connection with malarious fevers and in diseases which lead to mechanical impediment to the escape of blood from the spleen. Thus, in obstructive cardiac and pulmonary diseases, and especially in those diseases of the liver in which the portal vessels are involved, the congestion is well marked. It is also met with in cases of typhoid and typhus fevers and pyæmia. In ague and in portal obstruction the congestion is frequently repeated, the spleen increases to five or six times its normal bulk, and the enlargement often becomes permanent. Its existence is known by manipulation, when a large tumour is detected in the splenic region. The enlargement may be partly upwards towards the chest and downwards into the abdominal cavity. In cases of extreme enlargement, the tumour may occupy the whole of the left half of the abdomen ; very often it extends as low as the inguinal region, and in front to several inches to the right of the umbilicus. That it is a splenic enlargement is shown by its being readily movable, sinking and rising with the respiratory movements, and capable of displacement on pressure by the fingers. Its anterior edge sometimes presents notches characteristic of the spleen. As subjective symptoms the patient complains of a sense of weight or tension in the side and some amount of tenderness on pressure.

Hypertrophy.—It is generally the consequence of long continued congestion due to cirrhosis or to repeated attacks of ague. Rickety children often suffer from enlarged spleen. The subjects of this complaint are generally extremely anæmic, they suffer from hæmorrhage from the stomach or bowels, and ascites. On examining the tumour we find it tough and unyielding, and the sufferer complains of a sense of weight and tension.

Atrophy.—Atrophy of the spleen is extremely common and may follow hypertrophy. Lardaceous degeneration is more prone to occur in the spleen than in any other organ. The spleen is very much enlarged. The co-existing symptoms are those of extreme debility, there is more or less anæmia, with tendency to hæmorrhages. It is generally associated with degeneration elsewhere and hence marked cachexia generally coexists.

Symptoms connected with acute infectious diseases.

Fever.—When the attacks or paroxysms of fever alternate with intervals of exemption, the fever is known as simple intermittent. In remittent fever, instead of complete intervals of exemption from fever, the general disturbance is more or less continuous or marked by remissions and exacerbations. The three stages, viz. chill, febrile phenomena, and perspiration, as a whole constitute a paroxysm. A chill is characterised by languor, lassitude, depression of spirits, general weakness, shivering of the body, chattering of the teeth, and quivering of the lips. With the chill there may be headache, hurried breathing and vomiting. The skin over the body appears shrivelled up to a degree ; the pulse is frequent, small, and hard, and the urine passed is copious in quantity, limpid and of low specific gravity. The hot stage or the stage of febrile phenomena, is marked by flushes of heat or a glow of warmth over the whole body. The headache is intense. There is restlessness followed sometimes by delirium. The breathing, at first oppressed, becomes slower and freer. There is great thirst. The skin becomes pungently hot, the pulse full and strong, the urine scanty and high coloured. The temperature of the blood rises considerably. The sweating stage is known by the skin becoming moist, in a short time the sweating becomes profuse. Great relief is experienced; all the distressing symptoms subside, but a sense of more or less exhaustion remains.

In a general survey of the other acute febrile affections, the following are the main points which require notice. 1. Age at which liability is greatest. 2. Period of incubation. 3. The temperature. 4. Day on which the eruption appears. 5. Site of its first appearance. 6. Its character. 7. Its duration. 8. Premonitory symptoms. 9. Characteristic symptoms. 10. Duration of attack. 11. Principal sources of infection. 12. Period when infective properties are greatest. 13. Rate of mortality. 14. Complications. 15. Sequelæ.

CHICKEN-POX.

1. *Age.*—Generally under six years.
2. *Period of incubation.*—From a week to a fortnight.
3. *Temperature.*—101° to 104°, rising slowly.
4. *Day of the appearance of the eruption.*—First day of the fever.
5. *Site of its appearance.*—Face and chest.
6. *Its character.*—Rosy papules, vesicles, no pustules.
7. *Duration.*—From a week to a fortnight.
8. *Premonitory symptoms.*—Often none, sometimes slight feverishness, headache, and loss of appetite.
9. *Characteristic symptoms.*—None marked.
10. *Duration of attack.*—About a fortnight.
11. *Sources of infection.*—Breath and crusts, if any.
12. *Period when infective properties are greatest.*—Doubtful. Slight during eruption.
13. *Rate of mortality.*—Never fatal.
14. *Complications.*—None.
15. *Sequelæ.*—None, debility excepted.

SCARLET FEVER.

(*The numbers refer to the headings as above.*)

1. Majority of patients between two and thirty years of age.
2. Eight to fourteen days.
3. High, perhaps 104° or 105° early the second day, does not subside on the appearance of the rash.
4. Second day of the fever.

5. Neck and upper part of chest.

6. Universal, red or light scarlet, smooth to the finger, minute points coalescing to form patches; ends in general desquamation in scales and large flakes.

7. Six to nine days.

8. Sore throat, red tongue, rigors; convulsions in children.

9. High fever, marked sore throat, scarlet rash, strawberry tongue.

10. About three weeks in ordinary cases.

11. Shreds of epidermis, breath.

12. Most infectious during desquamation.

13. One in six in severe epidemics, one in thirty in milder forms.

14. Diphtheritic sore throat, kidney disease, swelling and suppuration of the cervical glands.

15. Croupous nephritis, albuminuria, pleuritis, otitis interna.

DENGUE.

1. All ages liable.

2. A few hours to one to seven days.

3. 103° to 104°.

4. A first rash of an erysipelatous character a few hours after seizure; later on, from the third to the seventh day, a second eruption.

5. Palms of hands and upper part of chest and neck.

6. Resembles erysipelas—indistinct, and soon fades on pressure; occasionally vesicles or large bullæ.

7. Variable, one to three days for each rash.

8. Fever, severe pains in limbs and trunk; convulsions in children.

9. Severe pains and swellings in joints; two eruptions, initial and terminal, fever; severe frontal headache. Relapses.

10. Varies, average eight days.

11. Uncertain. Disease eminently contagious.

12. Doubtful.

13. One in fifty.

14. Prostration, swelling of lymphatic glands and spleen, epistaxis; ophthalmia.

15. Stiffness and swelling of joints, diarrhœa, scurvy.

SMALLPOX.

1. All ages.

2. About twelve days.

3. Often high, 104° to 106°; falls speedily, nearly to normal, when eruption appears; rises again (104°) during period of maturation, then gradually declines to normal.

4. Third or fourth day.

5. Face, especially on nose and forehead.

6. Papular, becoming vesicular and pustular; desiccation and separation of crusts.

7. About fourteen days.

8. Shivering, pain in the back, vomiting; convulsions in children.

9. High fever, nausea, vomiting, and pain in the back, eruption, umbilicated vesicles and pustules; subsidence of fever, with subsequent recurrence; swelling of face, intense itching, disagreeable odour, eruption on mucous membranes.

10. Three to four weeks in ordinary cases.

11. Breath and skin; crusts.

12. During first week and during and after maturation.

13. One in ten of distinct natural smallpox, one to three per cent. in cases occurring after vaccination.

14. Pneumonia, kidney diseases, septicæmia, ophthalmia.

15. Anæmia, albuminuria, blindness from destruction of cornea, otitis, deafness, scrofula, phthisis.

MEASLES.

1. Under twenty.

2. Ten to fourteen days.

3. 103° to 104° (fifth day), influenced subsequently by complications.

4. Fourth day.

5. Face, especially about the mouth and eyes.

6. Raspberry-coloured spots in crescentic patches, clear skin between, rough to the touch, ends in branny desquamation.

7. Six to seven days.

8. Headache, rigors, fever, catarrh of the conjunctiva and air-passages, sneezing, sometimes convulsions.

9. Moderate fever; the eruption, catarrh, soreness of the eyes.

10. About fourteen days.

11. The breath and perspiration.

12. Most infectious in the prodromal stage and while the eruption is out.

13. One in fifteen, chiefly from complications.

14. Laryngitis, pneumonia, capillary bronchitis, and collapse of lung.

15. Pulmonary consumption, acute tuberculosis, otorrhœa, chronic periostitis, and various manifestations of scrofula.

Typhus.

1. Liability general, from early childhood to extreme old age.
2. Eight to nine days.
3. 104° to 106°.
4. Between the third and fifth day.
5. On the trunk, sometimes on the back of the hand.
6. Dusky-red spots and a subcuticular rash. The spots persistent, at first disappearing on pressure, after a few days fading, but not entirely obliterated. True petechiæ also occur. Spots persistent after death.
7. About fourteen days.
8. Chills, headache, languor, rapid prostration, catarrhal symptoms.
9. Great depression, headache, dusky cheeks, dull expression, delirium, prostration or somnolence, stupor and coma. Contracted pupils. Characteristic rash.
10. Three to five weeks, or longer.
11. Exhalations from skin and lungs.
12. Disease highly contagious at all stages.
13. About one in five.
14. Pneumonia, gangrene of lungs, softening of the heart.
15. Great debility, swollen glands, otitis.

Plague.

1. All ages liable.
2. From five to eight days.
3. 105° or higher.
4. Second or third day.
5. Carbuncles form on the limbs; buboes first appear in the groin.
6. Vesicles, carbuncles and buboes.
7. Various, perhaps a month.
8. Shivering, fever, swollen tongue.
9. Swellings of glands, carbuncles, pustules in various parts of the body, great thirst, vomiting, nervous disturbances, petechiæ, hæmorrhages, diarrhœa, &c.
10. From several hours to four or five weeks.
11. Exhalations from skin and lungs, discharges from the sores.
12. Disease contagious at all periods.
13. About one in three.
14. Extreme severity of one or more of the prominent symptoms.

15. Hæmorrhages, petechiæ, and various disturbances of the abdominal organs and of the nervous system.

TYPHOID FEVER.

1. Persons of middle age most liable.
2. About fourteen days.
3. 104° to 106°. A regular rise of 1° each evening, and morning remissions for the first five days.
4. About the seventh day.
5. Chiefly on the abdomen.
6. Lenticular rose-coloured spots in successive crops, each crop of two or three days' duration, slightly raised, disappearing on pressure.
7. About ten days.
8. Languor and feebleness, headache, abdominal pains, diarrhœa, epistaxis, pains in the limbs.
9. Fever, diarrhœa, the eruption, tympanites, gurgling in iliac fossæ, epistaxis, prostration after a few days.
10. About four weeks in favorable cases.
11. Principally the discharges from the bowels.
12. Doubtful.
13. About 1 in 6.
14. Intestinal hæmorrhage, pneumonia, bronchitis, peritonitis from perforation of intestine, nephritis.
15. Prolonged debility, anæmia, pulmonary consumption, partial paralysis.

Symptoms connected with disorders of the nervous system.

These are (1) *subjective* and (2) *objective.*

1. Subjective are *intrinsic* and *extrinsic.*

The *intrinsic* are—*a.* Abnormal sensations in the head. *b.* Those connected with the spine. *c.* Mental disturbance. *d.* Derangement of the special senses. *e.* Alterations affecting sensation and motion. *f.* Changes in nutrition, secretion and supply of blood to the different parts of the brain.

The *extrinsic* symptoms are referable to the derangement of stomach, bladder, bowels, and sexual organs.

2. *Objective.*—These are capable of detection by—*a.* Physical examination of the head and the spinal column. *b.* Tests for cutaneous sensibility. *c.* Tests for muscular movements and muscular irritability.

Disorders of the nervous system are characterised by derangement of the general sensibility. The sensibility may be altered and pain may be felt in any part of the body supplied by sensory nerves. The pain when localised in a part, and referred to the course of a nervous trunk is known as neuralgia. Any abnormal sensation in the head giving rise to pain is known as headache or cephalalgia. The pain may be diffused or localised. Other abnormal sensations are described as giddiness or vertigo, and dizziness in the head, heaviness and throbbing, or a sensation of heat or cold without any rise or fall of temperature or any redness. These sensations generally last for a short time and then pass off. Pain in the back may be diffused or circumscribed. It is a symptom in cases of spinal meningitis and myelitis, and is associated, though not invariably, with paraplegia or acute spinal paralysis. It is also complained of in other affections as aortic aneurysms, parenchymatous nephritis, lumbago, and uterine diseases. Persons suffering from muscular debility from any cause also complain of pain in the back. It is also a frequent premonitory symptom of smallpox. In some spinal affections there is a sense of tightness round the chest or abdomen, as though the body were encircled by a tight band.

Mental and emotional disturbances.—These are evidenced by (*a*) impairment of thought, judgment, memory, reasoning and perception; (*b*) various kinds of delirium, as delirium due to alcohol, fevers, and cerebral disorders; (*c*) delusions, illusions, and hallucinations; (*d*) alterations in spirits, temper, and disposition, as in melancholia and hypochondriasis. (*e*) Mania, dementia, idiocy, and imbecility; (*f*) impairment or loss of speech (aphasia); (*g*) sleeplessness or disturbed sleep; (*h*) coma and somnolency or sopor.

3. The subjective extrinsic symptoms referable to the brain are: 1. Derangement of the special senses, as that of vision, of hearing, of smell, or of taste. 2. Local manifestations as evidenced by touch or feel, and include (*a*) tenderness in any other part of the body; (*b*) increase of general sensibility (hyperæsthesia); (*c*) diminution of general cutaneous sensibility (anæsthesia or sensory paralysis). 3. Derangement of locomotion, or derangements of motion or power. These include (*a*) diminution or loss of power over voluntary muscles (motor paralysis); (*b*) impairment of or the inability to co-ordinate muscular actions (ataxia); (*c*) increased force, as convulsions, spasms, cramps, rigidity, tremor, and reflex movements. 4. Alterations in nutrition and the supply of blood to the muscles, leading to wasting, atrophy, and coldness of the paralysed parts.

The extrinsic symptoms, or those irregular manifestations which refer to the disorders of the spine alone are: (*a*) paralysis of the bladder and rectum, as the involuntary passage of urine and fæces, or retention or incontinence of urine, (*b*) excitement or abatement of the sexual powers, and (*c*) deranged appetite.

Objective symptoms.—These are only extrinsic, and ascertained by several methods of physical examination. Of the head, as to the size, shape, state of fontanelles, and with reference to tumours. Of the spine, as to the shape and tumours. Physical examination also enables us to estimate the general sensibility of the skin, by touch, pressure, pricking, pinching and electricity. Of the muscles as regards their movements, paralysis, convulsions, irritability. This is best done in the case of muscles by putting them into different actions, by testing their grasping and co-ordinating power, and by tickling the soles of the feet so as to excite reflex actions. Important evidence as to the action of a muscle is obtainable by the application of the constant and of the interrupted current. In the diseased condition it contracts more or less completely than in the normal state. In chronic cases the contraction under electricity is less, and sometimes it is altogether lost. Every physician is acquainted with symptoms met with in diseases of the brain and its membranes which also occur with disorders affecting other parts of the body and in diseases of the blood. Thus convulsions sometimes occur in spasmodic laryngitis, in whooping cough. Chorea is associated with chlorosis, articular rheumatism, and cardiac disease. In pneumonia the patient complains of headache, and is often drowsy or very restless at night. Delirium often sets in and may be constant. In severe cases delirium passes into coma. There may be subsultus and tremors of the muscles associated with involuntary passage of urine and fæces. Several symptoms due to disorder of the nervous system are often met with in fevers. These may be enumerated as headache, vertigo, delirium, a sense of soreness, and aching in the waist and loins, chills or rigors alternating with flushes of heat. In children convulsions often take the place of rigors in the beginning of the febrile paroxysm.

Derangement of general sensibility or altered sensibility. Pain.—Pain in any part of the body is a proof of the irritation of the existing sensory nerve of the part. It is a sensation which varies in character. It is variously described as burning, lancinating, dull, aching, griping, or shooting. Pain is a symptom of nervous diseases, it is also an accompaniment of acute inflammatory diseases wherever situated, and of spasmodic affections. Pain in a particular spot in the body is often due to a morbid condition or irritation of the sensory nerves of the part distant or remote, *e.g.* pain in the knee is common in diseases of the hip, in the testicle in cases of renal calculi.

Neuralgia.—Neuralgia is a functional affection. In it the pain is a marked subjective symptom and occurs without inflammation, and, as a general rule, without any appreciable nerve lesion.

Neuralgia signifies nerve suffering. It may attack any sensory nerve. It is a violent pain in the trunk or branches of a nerve, occurring in paroxysms, often at equal intervals, and is often referred to parts which have ordinarily no sensibility, as the heart. The pain is acute, shooting, tearing, or darting, with tenderness of the part upon pressure, but heat, throbbing, and swelling of the blood-vessels are rarely present.

In neuralgia the pain exists as a symptom. Although generally regarded as a functional disorder the pain may be the effect of neuritis or of nerve lesions due to inflammation in the neighbourhood of the nerve, or of neuroma or any other appreciable cause. The pain is described by different persons in a different way. Some may suffer very severely and yet they may do no more than complain of uneasiness. Others, on the contrary, may have very little pain, but would describe it in exaggerated terms as the most unbearable. Besides the description given by the patient about the kind of pain that he may be suffering from, its severity is often manifested by the changed expression of his countenance and peculiar gestures. Thus, in tubercular meningitis in children the pain in the head is expressed by their constantly applying their hands to the head, and by a peculiar cry.

Varieties.—*Facial neuralgia*, otherwise known as tic douloureux or faceache. It is a neuralgia in which the patients suffer either from a permanent dull pain affecting any portion of the three branches of the trigeminus (fifth nerve) or from paroxysmal attacks of violent twisting pain, which remaining for half a minute or more suddenly pass off and again recur. Such twinges are known as tics.

When the first or ophthalmic branch is affected (supra-orbital), pain is referred to forehead. When the second or superior maxillary branch (infra-orbital) there is excruciating pain, shooting over cheek, lower eyelids, alæ nasi, and upper lip. When the third or inferior maxillary (infra-dental), pain is referred to lower lip, alveolar process, teeth, chin, and side of tongue.

Cephalalgia or headache. It is a pain in the head due to acute or chronic inflammation within the cranium and to various conditions known as neurosis. Non-inflammatory headache is common in all fevers, essential or symptomatic, and as an effect of uræmia and other toxic conditions, as gout or rheumatism. It includes hemicrania and neuralgias affecting different nerves.

Hemicrania affects one side of the brow and forehead, often accompanied with sickness, sometimes periodical, and continues as long as the sun is above the horizon.

It may be due to all those circumstances which interfere with proper cerebral circulation, as congestion, cerebral anæmia, diseased condition of blood. It may arise from causes which depress the vital energies, as opium and alcohol. Headache is common in persons of sedentary habits, and in bilious persons and in those suffering from syphilitic disease of the bones of the skull.

In hysteria the pain in the head is localised and paroxysmal, and is often compared to the screwing down of a nail into the skull. In tumours of the brain the pain though localised is persistent.

Cervico-occipital neuralgia.—In this affection the pain originates from the first four cervical nerves. It is referred to sensory nerves of the occiput, nape of the neck, and the neck.

Cervico-brachial neuralgia.—In it the lower four cervical and the first dorsal nerves are implicated, and their branches are the seat of pain.

Odontalgia.—Neuralgia dentalis (pain in the teeth) is common in early months of pregnancy, and in disordered health. It often alternates with neuralgia of other parts. The disease may be limited to one tooth or may extend along the entire row.

Otalgia is a severe sudden pain in the internal ear. There is no fever, no heat, no redness, no swelling. It is often accompanied by temporary deafness.

Mastodynia, often known as irritable breast, occurs in young girls during the development of the breast, and often with uterine periods. The breast in females may be painful without any structural disease of gland, a small portion or the whole of one breast or both the breasts may be affected. The pain is often periodic and liable to exacerbations, sometimes it is darting like the shocks of electricity. The breast is somewhat hot and swollen, but the skin over it is of normal colour. It is often due to uterine or ovarian irritation. The disease often leaves the breast and extends upwards to the shoulder, or even to the fingers, or downwards to the hip of the affected side. The pain is generally most severe at the commencement of the menstrual period, and ceases with the stoppage of the flow, but it often lasts for weeks or months.

Intercostal.—Common in hysterical women, also in chlorosis; affects intercostal nerves, occurs in Bright's disease, phthisis, &c. The pain is of a dull, aching, darting, or throbbing character, sometimes lasts for weeks. Generally seated in sixth, seventh, eighth, or ninth nerve of the left side. Follows the course of nerves from front of chest to spine behind. Pressure sometimes detects one or two painful spots, but there is no fever. Such pain sometimes precedes an attack of herpes zoster. In pleurodynia the pectoralis major and the intercostal muscles are the seat of the pain. The local symptoms often simulate those of pleurisy.

Lumbo-abdominal neuralgia.—It exists more frequently on the left than the right side of the body. The pain is dull and heavy or occasionally sharp. The dorsal and upper pairs of lumbar nerves are the seat of pain, which is continuous in character and increased by exertion. It is often confounded with

Lumbago.—In lumbago the pain exists on both sides of the spine, it is situated in the sacro-lumbar and dorsal muscles. There is also tenderness of the part when pressed. During rest the pain ceases altogether, the muscular attachments being the parts mainly affected. The mere act of straightening the back in lumbago often causes great agony.

Sciatica otherwise called hip-gout, is the most frequent form of neuralgia. It literally means the hip. It is evidenced by paroxysmal pain at the point of exit of the great sciatic nerve, the pain affecting the posterior surface of the limb, and extending along the course of the nerve down the back of the leg and to the foot. It occurs most frequently in men over twenty years of age. Those of nervous temperament and of gouty and rheumatic habit are most prone to the attack. Those likewise whose occupation exposes them to cold or damp generally suffer. It is therefore common among sailors, gardeners, and fishermen. The disease seldom affects both sides. It is more frequently felt on the left side. It is often excited by the slightest cause when the predisposition is extreme. The skin is sometimes sensitive, but there is neither swelling, nor discolouration. There is persistent deep acute pain in the hip between the great trochanter and the tuberosity of the ischium, the pain shooting up and down the course of the nerve. It is occasionally followed by some degree of anæsthesia, and the muscles along the course of the nerve are often thrown into convulsive action. During the paroxysm the gait of the patient is considerably altered and the foot drags after him. The thigh may be slightly bent on walking. The limb eventually becomes weak and flabby, and wastes from want of use. The association of neuralgia with spasms, cramps, and local paralysis is very common. It lasts for indefinite periods, is liable to relapse, and difficult of cure. It is more common in men than in women. Sciatica is very often confounded with hip-joint disease. In coxalgia the pain is confined to the hip- and knee-joints. It is attended with fever, and the position of the limb is also altered. In hip-joint disease the patient is unable to support the weight of his body on the affected limb. On making pressure over the heel, so as to press the head of the femur against the cavity of the acetabulum, violent pain is felt.

Hepatalgia signifies a neuralgic or nervous pain in the liver. It is a functional disorder unattended with any change of structure; is often due to hysteria, the pain is often so acute as to simulate acute inflammatory disease. The disease is characterised by slight uneasiness or sense of weight in the hepatic region, often merging into pain. The pain is generally absent when the mind is occupied. It may be slight or severe, stabbing or lancinating. There is no fever, pulse is quiet, tongue clean, appetite good, and secretions and excretions healthy. There is no vomiting, but there may be jaundice. The patient often feels uneasy in his mind, and has a constant dread of some serious malady supervening. The pain is often mistaken for that due to the passage of a gall-stone. May affect nerves, either of common sensation or of organic life. May be due to sympathetic irritation, as in dyspepsia, to poisoned blood, as in malarious cachexia, or to pressure upon, or other causes irritating, the hepatic nerves.

Gastralgia or Gastrodynia (cramp in the stomach) is a neuralgia of the stomach. It varies from a sense of weight to a pain of great severity. It may be shooting or burning, it is often attended with cramps or symptoms of collapse. It is referred to the pit of the stomach, is paroxysmal and shoots in various directions, upwards into the chest, backwards to the spine or downwards into the lower part of the abdomen. It generally comes on when the stomach is empty, and is often aggravated after a meal. It is a frequent accompaniment of dyspepsia and hysteria, and occurs in females suffering from uterine derangements and anæmia. Habitual constipation, exposure to malaria, and excessive use of hot tea predispose to it.

Gastrodynia is sometimes an indication of cancer or of simple ulcer of the stomach. It occasionally comes on suddenly as a result of exhaustion produced by prolonged speaking. Of this an example may be mentioned which every one who has read the history of India will recollect. Burke was thus seized towards the end of his great speech on the second day of the trial of Warren Hastings.

Nephralgia is a painful sensation felt in the loins. The pain may be dull or severe, and is generally paroxysmal in character. It radiates along the course of the ureters or the spermatic cord. There is no fever, but sometimes there is retraction of the testicle as occurs in nephritis. There is frequent desire to pass water which is generally high coloured. There is also nausea and vomiting. It is generally produced by the passage of a renal calculus from the pelvis of the kidney, and is then known as a fit of gravel. It is often confounded with lumbago. The absence of pain on both sides, the pain not increased on motion, as by stooping and straining or by any effort, are symptoms which serve to distinguish it from lumbago. In this latter affection the urine is normal, and there is absence of nausea and of vomiting.

Angina pectoris is a paroxysmal neuralgic affection, characterised by severe sudden pain, and a sense of oppression in the region of the heart, and attended with a feeling of anxiety and impending dissolution. It is most common in men of advanced years.

Vertigo (*giddiness*) is a sensation of turning or whirling round or falling. To the patient surrounding objects are in a state of motion, he loses his balance for a time, grasps at some firm support, often recovers without falling down, and then sits down suddenly. Sometimes he staggers without feeling giddy; at other times he may feel giddy, without staggering. Sometimes vertigo passes off on opening the eyes, and sometimes on closing them. As a rule headache soon follows.

Varieties.—Vertigo may be constant or paroxysmal, felt only on moving the head, or in standing, or sitting; but may come on during sleep. In many cases it betokens general weakness, or is associated with convalescence from fevers or from acute diseases, or it may be symptomatic of diseases of the alimentary canal, of the heart or of the kidneys. Prolonged lactation also causes giddiness.

Mental disturbance.—1. *Feebleness of the mind* is a form of weakness of the mental faculties without any perversion, and occurs in many acute and chronic diseases. It is most marked in chronic diseases of the brain and its membranes. Thus in hemiplegia from cerebral hæmorrhage, the feebleness is shown by the proneness to tears or laughter displayed by the patient, though the intellect is little impaired. In hysteria there is loss of power of the will to restrain emotions and thoughts. In chronic meningitis, in cerebral tumours, in softening, and abscesses of the brain, the mind is feeble, and in extreme cases the patient is imbecile. Thus cerebral diseases are characterised by inability to concentrate attention, incapability to reflect, failure of memory, and impairment of judgment. The moral sentiments are also blunted.

2. *Insensibility*, *stupor*, *coma*, are synonymous terms signifying loss of consciousness. Coma may be due to injury to the skull; to alteration in the supply of blood to the brain; to effusion of serum or blood upon the brain; or to poison in the blood, introduced from without or generated within, as in uræmic poisoning, and in

epileptic convulsions. The observer should be on his guard against the feigned insensibility of malingerers.

Insensibility is a form of mental disorder in which there is suspension of all cerebral functions. The patient lies in a profound sleep, and is insensible to all surrounding influences. He is irrational and inarticulate.

Varieties.—The state of insensibility is designated by various terms, as syncope, trance, catalepsy, and coma.

Syncope.—It is a kind of fainting due to failure of the heart's action. The body exhibits a death-like pallor, there is loss of muscular power and of consciousness, and the muscles are relaxed and the joints flexible.

Fainting is a transitory condition, and may be brought on by various causes. It often occurs after the loss of a very large amount of blood. The body is flexible, the knees bend under the patient, he subsides into a sitting posture, his head drops forwards, and in a short time he regains his consciousness. He seldom injures himself. Often on awaking he feels giddy, or alarmed, or sick.

Trance is a condition similar to syncope, but in the former some consciousness is retained, the patient is able to hear, see, and remember what is going on about him, although he is unable to move or speak. The body is to all appearance inanimate, the limbs are perfectly flexible, and there is no power to move a muscle. The patient lies as if dead. There is no pulse, no respiration. After a while the patient may emerge from this state and begin to sing and dance.

Catalepsy is characterised by unconsciousness or insensibility and fixed rigidity of all or of many of the voluntary muscles. In it the patient does not fall but stands stiffly, or remains motionless, in various positions in which he may be placed. He is unable to move or to articulate, but can maintain positions difficult to sustain by the power of the will, and may remain in that position for a longer period than would be possible under ordinary conditions. External impressions, such as touching, pinching, &c., produce no effect. The attack lasts for hours, or even days, after which time the muscles begin to move. On recovery there is no recollection of what has occurred. The patients are usually women, and the attack commonly supervenes suddenly upon some mental emotion, or it may occur while the patient is following her ordinary occupation. The eyes suddenly acquire a fixed gaze, and the patient then at once ceases to work. The patient would remain stiff in any posture and like a corpse. There is no spasm or twitching of muscles. The pulse is slow and soft, respirations slow, and the extremities cold. In this condition there is neither the lividity of asphyxia, nor the pallor and flexibility of syncope, nor stertor as characterises coma, nor paralysis as in apoplexy, nor the movements and dreamy condition of somnambulism.

Coma is a form of mental disorder in which there is suspension of all the cerebral functions. The patient lies in a profound sleep and is insensible to all surrounding influences. It is a percursor of death in many cases where the brain is not primarily involved, and is a common symptom in severe affections of the brain. Coma may be due to the want of proper supply of blood to the capillaries of the brain. Thus it may be caused by :—1. The pressure exercised on the brain from effusion upon the surface or within the ventricles, or from injury to the skull (as depressed fracture) upon or outside the brain. 2. Alteration in the cerebral circulation, as from concussion, contusion, œdema, and extravasation or apoplectic clot. 3. To some poison in the blood, either introduced from without or generated within. These toxic agents are insufficiently oxidised blood, as in pulmonary congestion and other lung diseases, and in essential fevers; other agents are uræmic poison, as in cardiac and renal dropsy, narcotics, anæsthetics, and alcoholic beverages. The condition may also occur in functional derangements of the nervous system, as epilepsy, hysteria, catalepsy, &c.

Coma vigil is a condition of complete unconsciousness, with low muttering delirium, but the patient lies with his eyes wide open. It occurs in severe cases of typhus.

3. *Sleep* may be described as a condition in which the waste of tissue is reduced to a minimum, and is essential to all animals and even to many plants. In young animals the whole time is occupied in eating and sleep. In India eight hours' sleep is necessary for adults; in old age more sleep is needed as there is more waste of tissues, and the nutritive processes go on very slowly. In healthy sleep the person at first feels languor and welcomes drowsiness, the emotions and mental faculties are in abeyance, the eyelids then droop, and all the special senses cease to act. The limbs are half flexed, and voluntary movements cease; the eyes are closed, the pupils contracted; respiration and circulation become slow, and finally consciousness is abolished. *Profound sleep*, or *sopor*, is a condition in which the patient if roused does not feel refreshed as after natural sleep. It is a state which precedes coma and occurs in toxæmic conditions of blood, as in alcohol and opium poisoning, in apoplexy, in typhus fever, in fracture of the skull, and in compression of the brain from any cause. *Absence of sleep*, or restlessness, is an opposite condition. It occurs in delirium tremens, acute mania, encephalitis. It is produced in an acute form by rapid hæmorrhages, or more slowly in many exhausting diseases. It is also commonly met

with as a symptom of many acute diseases, as fevers. Jaundice has a tendency to prevent sleep or to render it uneasy. Strong tea and coffee also cause restlessness. Women of nervous or excitable temperament, and persons with mental anxieties, and those suffering from heart disease, suffer from imperfect sleep.

4. *Dreams* occur during imperfect sleep, generally towards morning when consciousness is returning. Children are apt to dream when they suffer from teething or worms, or from irritation of the bowels from any cause.

5. *Somnambulism* is a state of mental disturbance in which the patient carries out his movements as if awake. Shakespeare's description of Lady Macbeth (Act v, S. 1) gives a most exact idea of this state: "The eyes are open but their sense is shut."

6. *Nightmares* (incubus) are horrible apparitions or apprehensions, and the patient feels unable to stir in bed. He experiences a sense of suffocation or a feeling of oppression of weight on his back, and attempts to move his arms but finds he cannot. There is also palpitation of the heart.

7. *Delirium* is a temporary disorder of the mental faculties, as revealed in the language and action. Its character varies in different diseases, and in the same disease at different stages. It ranges from slight wandering to complete derangement of the mind. When slight the patient can be aroused to answer questions coherently. Delirium may be constant, but is generally worse at nights ; it may be passive and tranquil, or active and maniacal, noisy and violent, or low, with muttering and picking of the bedclothes. In active delirium the patient may be talkative or cheerful, or suspicious of all around him. He may be violent and attempt to do injury, and require to be restrained. It may be due to fever, or to blood or other poisons, to organic or functional derangement of the brain, to acute meningitis and hyperæmia of the brain, to diseases of abdominal viscera, as stomach, bowels, or uterus, to alcohol, belladonna, opium, or other poisons. *Alcohol* is an acute poison, and gives rise to the commonest form, known as delirium tremens or alcoholic active delirium. Its effects are the result of direct irritation, or of its influence on the brain, or of its circulation through various organs and tissues. It leads to their disorganisation, interferes with their nutrition, oxygenation, and metamorphosis. The tissues thus become degenerate, their poisonous elements circulate with the blood, and thus cause death.

Delirium tremens is marked by tremors of the limbs, fear of surrounding objects and wakefulness. In favorable cases it terminates in a critical sleep. The delirium is fidgetty or busy, and the delusions are superficial, as of rats crawling over the skin. They often lead to violence, to efforts to escape from imaginary objects. Delirium occurring during the day is serious. In fevers and other diseases it usually occurs at night. In acute diseases of the brain and its membranes, and in cerebral hyperæmia, it is active.

In general paralysis the delirium is passive and associated with delusions, but not violent. The delusion often relates to the acquisition of great wealth or distinction. Low muttering delirium is a succession of mild transitory delusions without any rational connection. It is most common in typhus and typhoid fevers, and typhoid conditions of the system from other causes. Is *rare* in brain diseases.

Derangement of special senses.—Symptoms which relate to vision and the eye in diseases of the nervous system are :—1. (*a*) Increased sensibility to light, (*b*) various alterations of vision, it may be defective or double (diplopia) ; lost as in complete blindness (amaurosis) ; (*c*) perverted, there may be flashes of light or dark spots, muscæ volitantes (floating), or scotoma (fixed). 2. Variations in the pupils. 3. Paralysis or abnormal motor impulses of the orbital muscles ; and (4) changes in the condition of the fundus of the eye as disclosed by the ophthalmoscope.

Deranged vision.—In hyperæmia of the brain, and in acute meningitis, certain portions of the retina become highly sensitive, and the patient cannot see objects clearly, he may have double vision (diplopia) or tremulous vibratile spectra. Double vision is common in disseminated sclerosis, and also as a symptom of locomotor ataxy. In both cases the defect may pass off for a time ; it may be unilateral or bilateral. Nystagmus may be present. In morbid growths affecting the brain there is often intolerance of light and occasionally double vision. In some cases complete blindness in both eyes occurs ; also hemiopia and appearance of muscæ. Diplopia is a symptom of certain affections of the eye without any brain disease. Wherever the two images do not fall on corresponding points of the two retinæ, double vision is produced. Thus, it is a common result of want of harmony between, or spasm or paralysis of, the ocular muscles. Increased sensibility to light is a symptom of acute meningitis and of hyperæmia of the brain. There is great intolerance (photophobia), looking at objects causes pain, and the patient tries to protect the eye against the light. In children, crying and the frowning expression denote intolerance of light. Total loss or impairment of vision (amaurosis) often occurs in advanced stages of basilar meningitis, and in tumours of the brain. It may affect one eye or both. In other cases amaurosis is a primary affection, or due to renal disease or diabetes. The pupils may be affected equally or unequally, the changes may be limited to one eye or to both. They may be dilated (mydriasis); contracted (myosis); sluggish or slow to contract; or immoveable under the influence of light. These changes may be due to intracranial or spinal diseases. Inequality of the pupils is a symptom of iritis. In some cases the irregularity may be natural. In the first stage of cerebral meningitis, both the pupils are contracted and there is intolerance of light. In cerebral hæmorrhage into the pons varolii and in cases of injuries, notable contraction of the pupil of one side is a marked symptom. Dilatation of the pupils, or their sluggish or immovable condition, is a symptom of pressure of a tumour at the base of the brain, of compression (hydrocephalus) of effused fluid, of apoplexy, of an advanced stage of meningitis and of atrophy of the optic nerve secondary to tumours. In epilepsy, and in chorea, the pupils are dilated. In unilateral disease of the brain there is dilatation of the pupil of one eye. This is also common in paralysis of the third nerve. Various narcotics or toxic agents, as belladonna, hydrocyanic acid, hyoscyamus, dhatura, and alcohol cause dilatation of the pupils. On the other hand in poisoning by opium, aconite and calabar bean, the pupils are contracted.

Paralysis of the orbital muscles.—The muscles which regulate the movements of the eyeballs may become paralysed in cerebral or spinal diseases. This condition is best evidenced by strabismus where the normal parallelism of both ocular axes is destroyed and there is difficulty in moving the eyeball in certain directions (double vision). In paralysis of the muscles supplied by the third or the motor oculi, the upper lid drops (ptosis). The eye turns outwards, there is external squint and slight protrusion; the pupil is dilated, and the eyeball cannot move upwards or downwards. Ptosis often occurs in facial palsy without any other abnormalities. In paralysis of the superior rectus, the eye deviates downwards and there is also ptosis. In paralysis of the inferior rectus, the deviation of the eye is upwards; paralysis of the internal rectus causes the eye to turn outwards, and in paralysis of the external rectus or of the sixth nerve, there is deviation of the eye inwards. In paralysis of the inferior oblique, the movements of the eye are not affected, and there is deviation downwards and inwards. The disorders of the eye and of vision, as symptoms of diseases of the brain and cord, are often associated with other morbid symptoms referable to these organs. There may be pain in the head or in the back, delirium, convulsions, paralysis (hemiplegia or paraplegia), ataxy, &c. Syphilitic growths, without cranial or spinal diseases, have a marked influence in giving rise to paralysis of the orbital muscles. Various intra-orbital affections also lead to paralysis of the muscles of the eyeball. Cramps or convulsive movements of the muscles of the eyeballs, when they occur, cause rolling of the eyes. It is a most common symptom in meningitis in children. In epileptiform convulsion and in hysteria, rolling of the eyes and strabismus show spasm of these muscles. There is no paralysis. Hysterical patients during the attack rapidly open and shut the eyelids (nictitation). They alternately fix and rapidly move the eyeballs.

Nystagmus or lateral or vertical oscillatory movements.—When constant, it is an individual peculiarity. Many albinos are seen in India with nystagmus. It is often a marked symptom of grave import and occurs in cases of disseminated cerebral sclerosis, and of cerebral hæmorrhage, and of cerebro-spinal meningitis.

Derangement in the fundus of the eye.—An examination by the ophthalmoscope of the fundus of the eye in cases of disordered vision is important in diagnosing cranial diseases and other disorders irrespective of cerebral mischief. Hyperæmia of the retinal vessels and of the optic disc may be due to intracranial and spinal affections, namely, acute or chronic meningitis, tumours, congestion of the brain, and is revealed by the ophthalmoscope. Ophthalmoscope also explains various other pathological conditions without intracranial disease. These are due to diseases within the orbit or to inflammation of the choroid. It also reveals changes connected with diseases of the heart and kidneys, exophthalmic goitre and alcoholic intoxication, syphilis and diabetes, and leucocythemia. By its use we are able to discover an anæmic condition of the retina, without any cranial disease, in persons who suffer from epilepsy or from embolism of the central retinal artery. In them there is sudden loss of vision of the affected eye. The examination also reveals the presence of congestion of the retinal veins or of the choked discs. This latter appearance denotes obstruction to the return of blood from the ophthalmic veins. This occurs in cases of meningitis and in cerebral tumours. It may be mistaken for optic neuritis, but in congestion there is associated œdema and hæmorrhagic extravasations. The vision is also dim. It also reveals optic neuritis, an interstitial inflammatory affection of the nerve-trunk. It is symptomatic of basilar meningitis, either simple or tubercular, and of cerebral tumours. It may affect both eyes or one eye only. In this disease the sight is impaired. The ophthalmoscope also reveals the existence of atrophy of the optic disc which occurs as a primary affection in sclerosis of the posterior lateral columns of the cord (locomotor ataxy) and in cerebro-spinal multiple sclerosis. Atrophy may also be due to cerebral tumours or inflammatory exudations, and may be limited to one eye or may affect both. Atrophy is often secondary to congestion of the ophthalmic veins or to optic neuritis. The ophthalmoscope also reveals the existence of tubercles in the choroid coat, in acute miliary tuberculosis, and in phthisis. In tuberculous meningitis they are extremely rare.

Sense of hearing.—The defect, or loss of sense of hearing occurs in various diseases of the nervous system. It is also a symptom of various disorders of the ear. It varies from slight impairment to a complete loss. There may be intolerance of sound or various noises in the ear. The aberrations may affect only one ear or both. Intolerance of sound is a symptom of acute meningitis, and of the early stage of hyperæmia of the brain. The loss of sense of hearing or deafness may be produced without cranial disease. It may be due to congenital defects in the ear, to severe coryza, scarlet fever, and to accumulations of wax in the ear. It is sometimes caused by quinine, and may occur in typhus and typhoid fever. The impairment of sound in one ear, rarely in both, is sometimes due to cerebral hæmorrhage and softening. In meningitis and in tumours of the brain, the hearing is impaired or lost. Tinnitus aurium, or ringing in the ear, is frequent in cerebral affections, and is also a symptom of anæmia and of accumulation of cerumen in the ear. It may be caused by the continued use of quinine or strong coffee, and it occurs in cases of nervous debility due to overstrain. Noises in the ear is a very frequent symptom in Menière's disease. The patient complains of noises in one ear only, sometimes in both ; but in the latter case it is more pronounced in one than the other. The noise varies from a buzzing, whistling sound to a sudden explosion. It is often associated with vertigo.

The sense of smell.—It may be increased or perverted, so that agreeable odours become disagreeable, or altogether deficient. The defect may be congenital. In hysteria, epilepsy, and in various nervous diseases as right hemiplegia with aphasia, and in the insane, this abnormality is common. Diminution or loss of the sense of smell is common in cases of polypus in the nose, and in syphilitic ulcers. In diseases of the frontal or the ethmoid bones, the olfactory nerve loses its power of conducting sensation. Loss or diminution of the sense of smell is also common in coryza. The sense of smell is lost in cases of dryness of the Schneiderian membrane, in lachrymal fistula, and in paralysis of the fifth or trigeminal nerve, and in paralysis of the facial. When the nasal mucous membrane is dry and swollen the lachrymal secretion overflows instead of passing into the nose. In the aged the atrophy of the olfactory nerve leads to loss of sense of smell. The same thing occurs in meningitis and in tumours in the anterior lobes of the brain.

The sense of taste.—It is increased or perverted in the hysterical and in the insane. In gastric derangements, in fevers, and in acute inflammations, coating of the tongue or great dryness indicates impairment or loss of this sense. In paralysis of the glosso-pharyngeal nerve the sense of taste is abolished on one side of the root of the tongue and fauces. In paralysis of the fifth nerve and in facial paralysis, owing to the anatomical relations of the chorda tympani nerve, the sense of taste at the apex and anterior half of the tongue is abolished. Also in diseases of the middle ear, or in caries of the temporal bone, involving the chorda tympani nerve, there is unilateral loss of the sense of taste at the anterior part of the tongue.

Morbid sensibility.—Other local manifestations, as induced by touch or feel, refer to tenderness or hyperæsthesia. Hyperæsthesia is a morbid increase of the general sensibility of a part. The part is tender to the touch. The condition may range from the slight over-sensitiveness to light, sound, heat, and cold, which exists in many weak conditions of the body, to actual pain with all its varieties of degree, character, and position. Pressure on a tender part or parts in neuralgia causing pain is an example of hyperæsthesia with pain. Other examples of hyperæsthesia may be cited. In vaginismus there is hyperæsthesia of the mucous membrane of the vagina. It is common in hysteria, it sometimes occurs in the early stage of fevers, and occasionally in inflammatory affections of the cranium. In these cases the hyperæsthesia is cutaneous. Hyperæsthesia in connection with nervous disease is also cutaneous. Hyperæsthesia of the abdomen is common in hysteria, and may simulate peritonitis or hepatitis. In such cases slight pressure or mere contact with the fingers, gives rise to agonising pain, but firm pressure, when the patient's attention is directed to some other object, can be borne without pain or discomfort. General sensibility may become perverted and is known by the term paræsthesia.

Perverted sensibility.—The perverted sensations or dysæsthesia indicate an advance of anæsthesia. Thus numbness, tingling, and formication pass into stabbing, shooting, and boring pains. True neuralgic pains are of this kind. The pain of angina pectoris, of colic and other similar affections, is of a shooting character. The pains may occur in paroxysms, and follow one another in rapid succession. There are some neuralgias which affect the viscera and others which are connected with special nerves.

When the general sensibility is diminished or abolished altogether anæsthesia is said to result. Anæsthesia is a kind of cutaneous sensory paralysis, and varies in degree. It is *incomplete* when the sensibility is more or less diminished, and *complete* when the sensibility is altogether lost. It also varies in extent. Thus it is sometimes *local* or confined to a particular and circumscribed part of a limb, as the palm, or sole, or muscles; *partial* if it extend to a considerable portion of the body, as both lower limbs, or the lateral half; and *general* if there be total loss of sensation throughout the body. Anæsthesia may be limited to the skin or to the muscles. In muscular anæsthesia there is loss of the muscular sense. The affected muscles can be made to act in the desired way only if the patient looks stedfastly at the limb or part he wishes to move. Cases of anæsthesia sometimes occur in which there is impairment or loss of sensibility to pain and to tactile impressions, or the sensibility to pain may be lost and the tactile sensibility remain. The impairment of cutaneous sensibility is best determined by pricking or pinching the skin, and by the faradic and galvanic currents. The relative tactile sensibility of various parts of the skin is ascertained by touching the surface with the points of a pair of compasses, and discovering the smallest distance at which the points are recognised as distinct from each other. The greatest delicacy is manifested on the point of the tongue, and on the palmar surface of the end of the fingers. Some disparity is often noticed between the two sides even in health. If the impairment or loss of sensibility be on one side, it may be determined by a comparison with the corresponding situation on the opposite side. The impairment of muscular sensibility may best be determined by asking the patient to rise from a chair with his eyes closed. He may be utterly unable to do so, or the movements which accompany the attempt are awkward and imperfect. Also if an object be put into the hand, while the eyes are closed, it will fall from the patient's grasp. Similarly if the sensibility of the feet be impaired or lost, the sufferer feels the contact with any object as if the affected part were covered with a thick, soft down. Thus in locomotor ataxy, if the feet touch the ground they feel as if they are in contact with cotton wool. In such cases the guidance by the eyes is necessary. In a majority of cases of tactile anæsthesia, there is also impairment of sensibility to pain and diminished or disordered motor power. The muscular sense or the sense of temperature is diminished and the patient is not aware if the feet be pricked or pinched; he is also unable to distinguish painful impressions of heat and cold. Cutaneous anæsthesia as a symptom of nervous disorder varies in extent and situation.

General anæsthesia.—As a symptom of intracranial and spinal diseases is known as cerebral and spinal anæsthesia. Cerebral anæsthesia is manifested in various intracranial affections, viz. cerebral meningitis, meningeal hæmorrhage, sclerosis, softening. It is also noticed in the general paralysis of the insane. Spinal anæsthesia denotes diseases of the spinal cord, chiefly of its upper portion. Nerve anæsthesia is a symptom of inflammation affecting the nerve-trunk, of pressure of a tumour, or injury to a nerve. In these conditions motor paralysis accompanies the sensory paralysis. Anæsthesia can also be induced toxically by alcohol, opium, chloroform, and other similar agents. In toxic cases there is incomplete coma. These agents in small doses diminish the sensibility to pain, but without abolising tactile impressions. Unilateral anæsthesia is otherwise known as hemianæsthesia. It is more often noticed on the left than on the right side. It may be associated with unilateral motor paralysis of the same side (hemiplegia). It may be due to cerebral lesions as hæmorrhage, embolism. *Hemianæsthesia* denotes the intracranial disease localised in some of the fibres either of the cerebral hemispheres or of the ganglia, or in the crus connected with it; it thus denotes diseases affecting the optic thalamus, the crus cerebri, the pons varolii, and some portion of the white substance. When hemianæsthesia, with or without motor paralysis, depends on a cerebral lesion it will be likely to extend to the mucous membrane of half of the mouth, tongue, soft palate, and the conjunctiva of the eye of the affected side. Hemianæsthesia is often associated with spinal hemiplegia of the opposite side. It denotes lesions limited to the lateral portion or column of the cord corresponding to the hemiplegic side, the anæsthesia being on the opposite side owing to the decussation of the sensory fibres within the cord. In this hemiplegia the anæsthesia does not extend to the tongue, mouth, soft palate, and conjunctiva. In some cases anæsthesia is associated with paraplegia; the disease then affects the sensory fibres or involves the grey matter of the cord. Anæsthesia or sensory paralysis without motor paralysis in the lower limbs is rare. It may affect tactile sensibility, sensibility to pain, or both. Anæsthesia of the upper or the lower limbs is common in diseases affecting the posterior lateral portion of the cord (locomotor ataxia).

Anæsthesia may be noticed as a symptom of hysteria without any cerebral disease. In it hemianæsthesia of the left side is more often noticed than of the right side. It may even extend to the mouth, tongue, soft palate, and the eye of the affected side. The anæsthesia may be more or less complete and general, or only affecting patches, as palms or soles or both, back of the hands, and ankles. Vaginal anæsthesia also occurs in hysteria. Local anæsthesia may also be due to morbid conditions seated somewhere in the course of a particular nerve, or in the spinal cord, or in the brain. It may be a symptom of inflammation affecting a nerve trunk, of pressure of a tumour, or of injuries to a nerve. In these conditions motor paralysis accompanies the sensory paralysis; the fibres of motion as well as those of sensation being affected. The nerve-anæsthesia, like local nerve-paralysis, affects the sensory nerve or its nucleus, and thus affects the same or the diseased side. In paralysis of the trigeminal nerve the anæsthesia may be limited to the parts supplied by one of its branches or may prevail over the area of its entire distribution. In this affection there is anæsthesia of the skin and mucous membrane. It embraces one side of the face, namely, the forehead, the temple, the conjunctiva, the mucous membrane of the nostrils, mouth, lips, tongue, and pharynx of the affected side. In total abolition of sensation, inflammation, ulceration, and even gangrene of the skin, and ulceration and perforation of the cornea are apt to occur. The affection of the cornea may be due to the loss of tactile sensation, the patient being unable to recognise the presence of irritants and other influences, and taking no steps to guard against their effects. Cases occur in which irritation of sensory nerves is attended with neuralgia and is followed by erythema of the skin, with redness, which may even proceed to vesication or pustulation. Herpes or zona is an example of this nature. The leprosy which leads at first to overgrowth of cells in the course of nerves, and to their subsequent destruction and consequent anæsthesia, is another example. If unchecked it goes on to motor paralysis and also to atrophic changes in the muscles, and to erythema of the skin.

Another kind of anæsthesia is known as muscular anæsthesia. During health, when a muscle, *e.g.* the biceps of the arm, is struck, a slight pain is experienced. Similarly in cramp, the pain is felt in the muscles only. A powerful current of faradaic electricity to a muscle causes pain. Not so when muscular anæsthesia exists. In motor paralysis the electro-sensibility is often impaired or lost. Similarly in the diseased condition known as locomotor ataxy there is impairment of muscular sense, which explains the difficulty of maintaining the equilibrium of the body while standing and with the eyes closed.

Derangement of locomotion or motor power. Symptoms relating to deranged muscular movements.

There may be (*a*) *diminution* or loss of power of the will over voluntary muscles, a condition known as paralysis; (*b*) *impairment* of the power of co-ordination, known as ataxia. (*c*) The motor power may be *increased*, as in convulsions, spasm, cramps, or may be altered, as in tremors.

Motor paralysis (akinesis) may be due to disease or injury of that portion of the brain where the power of will resides, or to disease of the spinal cord. It may also be due to diseases or injury of the nerves which conduct impressions from the brain to the muscles. Compression of the arm, when a man falls asleep in a chair, leads to palsy of the limb below the elbow. It is often caused by disease or injury of the muscles.

The paralysis is chronic when due to the arrested nutrition of the nerve-endings, owing to the stoppage of the flow of blood through the arteries supplying them. Thus, the motion is diminished in muscular debility and in acute diseases, in actual prostration, and in torpid persons. Paralysis, or palsy, is its extreme condition, and implies a complete or partial loss of motion or of sensation, or of both, in one or more or all parts of the body. The loss of motor power may vary from slight feebleness to the most complete inability to perform any movement.

Paralysis is complete where power of motion is entirely lost. It is incomplete where the voluntary power is greatly diminished. The incomplete paralysis is often termed paresis. Paralysis may be general, or partial and local, according to the extent or number of muscles paralysed. It is termed *general* when it affects the four extremities with or without paralysis of the muscles supplied by the cranial motor nerves ; *partial* when it affects only a portion of the body. It is called *hemiplegia* when the paralysis is limited to one side of the body, *paraplegia* when it affects all parts below any given transverse line, *diplegia* when the paralysis extends to both sides at the same time. A local paralysis is a term which signifies paralysis confined to a few muscles, or perhaps only to a single muscle, *e.g.* ptosis, strabismus, facial palsy.

An arbitrary arrangement has been made with a view to assist the reader in the general study of paralysis, and I shall treat the subject in the following conventional order :—Paralysis may be motor or sensory. With reference to the seat of the disease, paralysis is also divided into cerebral, bulbar, spinal, and peripheral nerve paralysis. *Cerebral motor paralysis.* It may be due to injury, hæmorrhage, embolism, thrombosis, abscess, tumours, and sclerosis of the brain. The mischief may involve either some portion of the motor tract, or of the cerebellum, or some portion of the sensory tract. There is commonly paralysis of the upper and the lower limb on one side, with paralysis of the muscles of the face and tongue (hemiplegia). This paralysis is connected with disease of any part of either hemisphere of the cerebrum. A general paralysis, where the four limbs are incompletely paralysed, is rare, as of a cerebral origin, and is then associated with paralysis of the face and tongue. Local paralysis, of a cerebral origin, except in cases due to lesions of cranial motor nerves, is also rare. Cerebral paralysis can be easily known from affections due to a spinal or peripheral lesion. In cerebral cases there are associated cerebral symptoms which denote diseases of the brain, and paralysis is often associated with anæsthesia or with sensory paralysis. In it the muscles are subject to reflex, convulsive, or spasmodic movements, such as are independent of the will. In long-continued cases the paralysed muscles slowly atrophy. *Bulbar paralysis* is connected with disease in the medulla oblongata and pons Varolii, parts where important nerve nuclei are abundant, and motor and sensory fibres meet and blend. There are other forms of paralysis. Thus we find cross paralysis of one side of the body and of the opposite side of the face, or paralysis of both arms and legs, or one arm and both legs, or one leg and both arms, or paralysis of one or of both eyeballs, of one or other or both facial nerves; or there may be paralysis of muscles of voice, speech, mastication, deglutition, or respiration, or of the bladder or rectum. In some cases cerebral and bulbar paralysis are combined together.

Spinal paralysis.—Spinal paralysis is due to injury, or disease, or lesion of the spinal cord, and usually takes the form of paraplegia. Hemiplegia from spinal disease is rare. The lesion may be hæmorrhage in different parts, thrombosis, embolism, abscess, tumours, or sclerosis, and the disease or injury may be situated in the cervical, dorsal, or lumbar portion of the cord. Anæsthesia may or may not be associated with it. There is often a sense of constriction round the body. Unilateral affection of the spinal cord may give rise to motor paralysis on the affected side and sensory paralysis of the opposite side. Spinal paralysis is usually bilateral. In disease localised in the upper portion of the cord, or extending from below to this portion, the paralysis is general, but this spinal paralysis does not involve the face and tongue as in the general cerebral paralysis. The muscles of the orbit are often paralysed at the same time, and contracted pupils are frequent. In spinal paralysis incontinence or retention of urine, which is rare in cerebral paralysis, often occurs. Also priapism, seminal emissions and impotency are common. The electrical excitability of the paralysed muscles is often weakened or wanting. The reflex movements are either increased, diminished, or lost. Atrophy of the paralysed muscles is more constant and rapid than in cases of cerebral paralysis.

Nerve-paralysis, otherwise termed peripheral paralysis. It is usually local, and generally involves one nerve or a few nerves at the base of the brain, and comprises the whole course from their cerebral origin to their terminations. It is due to nerve lesions below the nuclei of origin of the affected nerves, or to lesions involving the nerve trunk. Paralysis due to compression of the arm is supposed to be due to injury to the nerve trunk of the arm. It may affect a single muscle or a group of muscles. Thus we may have local paralysis of the external rectus of one eye, or of superior oblique, or amaurosis, or paralysis of muscles of expression or of the head or neck. In nerve-paralysis anæsthesia is associated with motor nerve paralysis, and reflex movements cannot be excited in the paralysed muscles, there are no irregular spasmodic or convulsive movements in the paralysed muscles as is the case in spinal or the cerebral paralysis. Voluntary power of the brain or cord is retained over those muscles which receive branches of the affected nerves between the lesions.

The electric current applied to the affected nerve between the lesion and the brain fails to excite the paralysed muscles, but the current, if applied between the lesion and the muscles, produces its ordinary effect. The paralysed muscles soon grow flaccid and waste in a marked degree. Other symptoms of cerebral and spinal disease are also wanting. The paralysis most generally affects the third, fourth, and sixth, portio dura of the seventh and spinal nerves.

Ischæmic palsy is common when a ligature is applied to a main artery. The paralysis is attended by a speedy loss of faradaic irritability, and also by atrophy of muscles.

Cause of paralysis.—All paralytic affections, either cerebral, spinal, or peripheral, depend on various morbid conditions, namely, injury, hæmorrhages, thrombosis, embolism, abscess, tumours, and sclerosis. The sclerosis of the brain or of the cord, or of both, may give rise to infantile spinal paralysis or to general spinal paralysis; lateral sclerosis is the cause of progressive muscular atrophy, and of tabes dorsalis ; glosso-labio laryngeal palsy depends on sclerosis of the seventh, eighth, and ninth nerves.

Functional paralysis.—Various kinds of functional paralysis occur, and are due to abuse of mercury, alcohol and lead, and to exposure to cold. Myopathic varieties of paralysis are due to morbid degenerative changes in the muscles, *e.g.* progressive muscular atrophy, wasting palsy, and pseudo-hypertrophic muscular paralysis. Hysterical paraplegia is a functional disorder produced by fright or ovarian irritation.

Reflex paralysis —Besides the variations above alluded to we have paralysis (reflex) due to some peripheral irritation affecting the nerve centre. In spinal paralysis, in spinal meningitis and in some cases of myelitis, the tickling of the soles of the feet produces involuntary movements. Similar involuntary movements are caused by striking certain tendons. In diseases of the urinary organs, of the uterus and of the intestines, reflex paralysis sometimes occurs.

Very frequently in rheumatic subjects the deltoid or the trapezius becomes paralysed, and there is difficulty in raising the arm. As a sequel of diptheria, just as the patient is beginning to improve, paralysis of the pharynx and other parts often occurs. Other forms of paralysis occur; one is produced by metallic poisons, as mercury, and lead, another form of paralysis is due to long continued course of writing, and is known as writer's palsy.

Ataxia.—It is not a true paralysis. The term is used to express a loss of power, or an impairment of the power of co-ordinating muscular movements, although the influence of the will is intact. The morbid condition is known as locomotor ataxy, tabes dorsalis, and myelo-phthisis. It differs from paralysis in that the power of the will is diminished or lost in paralysis, in ataxia there is incapability to produce and co-ordinate muscular movements. Ataxia is due to sclerosis of a portion of the posterior lateral columns of the cord, and is therefore a spinal disease.

The motor power may become increased, and the symptoms manifesting themselves in diseases of the brain and cord are cramps, convulsions, spasms, etc. The motion is increased, and muscular spasm or convulsion is said to exist.

Convulsions.—There is an increased involuntary contraction of voluntary muscles, the movements are general, violent, and paroxysmal, they extend over a large part of the muscular system Convulsive movements may be limited to one side (unilateral). They are then symptomatic of disease of one hemisphere of the brain. When limited to the lower limbs, convulsion denotes spinal disease, not above the lumbar portion. Convulsions may be partial or local and limited to one set of muscles, as in facial spasm and spasm of the glottis and of the diaphragm. Often the convulsion may be stronger on one side than on the other. The movements may be periodical or otherwise; may be reflex as depending on worms or teething.

Spasmodic convulsions.—These are of two kinds, clonic and tonic.

Clonic.—Epileptiform convulsions and those due to uræmic or alcoholic intoxication are clonic spasms. These spasms are also associated with the presence of albumen in the urine. They consist of violent and alternate, rapid and repeated flexor and extensor movements of the arms and legs, jerking movements of the head and face and of the eyes at short intervals. The parts are in active motion while the convulsion lasts. Such attacks occur during pregnancy and are known as eclampsia puerperalis. They are similar involuntary contractions of voluntary muscles, but less violent, are of longer duration and confined only to a small portion of the muscular system. This group also includes spasm of the involuntary muscles, which may be unilateral, or general, or confined to a single set of muscles.

Tonic.—Tonic contraction is characterised by a fixed or more enduring rigidity of great intensity; often the contractions are partial. They are always of considerable duration. The affected muscles are rigid and hard for a long time, as in tetanus and strychnia poisoning. In spastic paraplegia in infants the legs and arms are rigid. After fatigue cramps occur in the calves of the legs. Cramps which occur in Asiatic cholera, and the rigidity of limbs in some forms of paralysis are of this kind.

Choreic spasms.—These are allied to clonic spasm and tremors. They have been described as insanity of muscles. The spasm is characterised by abrupt, jerking, irregular movements due to the affection of the motor nerves which prevents them from acting precisely under the control of the will. The voluntary movements are interrupted by various contortions of various muscles. There is spasm of the limbs and of facial muscles, also of the lips, tongue and larynx, either separate or combined. Spasm often extends to the head and trunk. It may be limited only to a limb. Chorea thus simulates rotatory or other irregular movements of hysteria. The ability to coordinate voluntary movements is impaired or lost, and hence chorea simulates the awkward movements of ataxia. In chorea the spasms cease during sleep. They are aggravated when the attempt is made to check them, as is also observed in the paralytic form of trembling.

Atethosis is a peculiar form of convulsion resembling chorea. Like it, it ceases during sleep. It is a spastic condition of the flexor muscles without any disorder of the nervous system. In it the sensibility to pain, heat, and cold is intact. The cutaneous sensibility is unimpaired. There are no jerks as in chorea. The movements are slow, deliberate, and forcible. The hands and feet are distorted when in use, and when at rest, owing to unopposed muscular contraction. There is want of power to stand erect, or keep the body or limb in any one position for a length of time. There is difficulty to grasp any particular object. The movements are more complex when the eyes are closed. The muscles seldom waste. The disease often supervenes on hemiplegia.

Muscular movements resembling spasm or convulsions occur in hysteria. In these cases the movements are produced by the will, but effected in an irregular and aimless manner. Forcible closure of the jaws and spasm of the muscles of the forearm are examples of tonic spasm of an hysterical kind.

In catalepsy the muscular system of the trunk and limbs remains in a state of tonic spasmodic contraction for a long time. Pseudo-convulsive movements are often observed among the malingerers.

Cramps.—Cramps is another example of local spasms (tonic), limited to a single muscle or to a set of muscles. The condition is extremely painful, and recurs frequently and at short intervals.

The gastrocnemius muscle is most frequently affected, after long walking, during pregnancy, during swimming, and during labour. Cramps mostly occur at night. They are a prominent symptom in cholera. In colic, cramps of the abdominal muscles frequently occur. In poisoning by arsenic and strychnia, cramps in the legs are prominent symptoms. Allied to spasm and tremor is the subsultus. It is a muscular jerking movement most frequently noticed in the tendons of the muscles of the wrists and forearms, in the course of continued fevers. The shaking caused by large doses of quinine has been mistaken for it. Closely allied to this are the movements known as picking of bed-clothes, which indicate extreme nervous debility. *Fibrillar twitching* of the muscles of the lower limbs are noticed in progressive muscular atrophy and in some cases of myelitis.

Very often convulsive movements of various kinds are associated with paralysis. Thus we have abnormal muscular movements known as tremors or trembling. These are oscillatory movements of muscles in a rhythmical order. They generally cease during sleep. Some of them are particularly prone to occur during voluntary efforts, and are then supposed to be due to debility. Thus they are noticed in disseminated sclerosis (cerebral or spinal), where the paralysed muscles become rigid and likewise contract in an irregular manner. In paralysis agitans, where there is trembling of the lips and tongue, the paralysis is subsequent to the tremors. Other tremors are known as true convulsive tremors. These are independent of the acts of will and are irremediable. They occur in old age. They are often the effect of toxic agents, as alcoholic drinks, or of the abuse of opium, coffee, or tea, or are due to lead or mercury. The flickering tremors of the upper or lower lid, the tremulousness with chattering of the teeth in exposure to cold, and in rigors which accompany the cold stage of fever, and the subsultus tendinum in the typhoid state are instances of irregular muscular movements. Similar tremors are found affecting the lower limbs of the paraplegic.

Rigidity, violent contraction, and stiffness of muscles.—These occur in cerebral irritation and chiefly affect the extremities, *e.g.* spastic paraplegia in children. When confined to one region, as to the recti muscles, they indicate that there is some tender organ beneath.

In paralysis, persistent shortening of muscles, which are antagonistic of the paralysed muscles, often occurs and leads to deformities. The shortened muscles after a time become rigid from sclerotic changes and the contraction then becomes permanent. Aching pains and tenderness in muscles often occur during convalescence from severe diseases or in their acuter stages.

Myoidema.—It is a sort of muscular irritability, which is manifested on smartly percussing the pectoralis major muscle with the tips of the fingers, when small tumours are often observed to develop at the points of percussion. It is common in cases of nervous exhaustion from overwork. It is connected with defective nutrition or a degenerative change in a muscle. Thus it is more marked in cases of muscular atrophy, and is accompanied by fibrillar twitching, and in atrophy of muscle which occurs as a part of general emaciation, or of chronic or severe acute disease or of hectic. It is also frequent in typhoid fever. In cases of empyema, pneumothorax, and in phthisis, the muscles of the sound side having to do more work become exhausted, and myoidema is apt to occur.

Excessive reflex movement.—This is a kind of involuntary spasmodic movement produced by irritation of the peripheral nerves. Thus in cases of spinal paralysis, by irritating the soles of the feet abnormal movements are excited. The reflex excitability is absent or very slight in diseases of the cord leading to disorganisation.

In general paralysis, in paraplegia and in local spinal paralysis there is abnormality as regards reflex movements.

Tendo-reflex.—Is a similar involuntary muscular movement produced by irritation of certain tendons.

The patellar tendon reflex is a muscular spasm or jerking movement. It is evoked during health, by striking the ligament just below the patella while the leg is hanging loosely. The rectus femoris muscle is called into action. A similar result may be produced upon the tendo Achillis and triceps muscle of the arm.

In ataxia this tendo-reflex is wanting, similarly in spastic spinal paralysis and in spasmodic tabes the movements are abnormally increased.

Symptoms relating to disorders of the nervous system have also reference to certain forms of disordered nutrition of the skin, muscles, joints and bones. They also relate to certain lesions affecting the viscera, especially the kidneys and bladder.

Various physiological and pathological phenomena connected with the nutritive processes are regulated by the action of the sympathetic. Certain disorders of the skin, muscles, bones, joints, and of the kidneys and bladder, occur in affections of the nervous system. In them the cerebro-spinal system is at work in effecting such various changes.

Skin.—Inflammation, ulceration, and gangrene, are apt to occur in paraplegia associated with complete anæsthesia.

Mucous membrane.—Redness of the conjunctiva and ulceration of the cornea and even destruction of the globe of the eye occur in diseases of the branches of the fifth pair. In these cases there is loss of sensation, the diseased parts are not affected by the presence of any mechanical irritants and thus do not avoid their operation.

Herpes or Zona is often observed in cases of irritation or injury of the sensory nerves of the arm or the leg, or in cases of tumour pressing on the fifth nerve. The redness is distributed to the area supplied by the nerve and may often pass on to vesication, pustulation, ulceration or gangrene.

Bedsores.—These are the common results of paralysis; they may also occur from constant pressure over the part, as in fever cases where the patient may be collapsed and remain in one position for many days. The parts not being cleansed of the patient's secretions owing to the neglect of nurses, assume a dark brown colour, blebs form on them, which on bursting leave an ulcerated skin behind. In hemiplegia and paraplegia bedsores are extremely common on the hips, even though the utmost attention be paid to cleanliness and to the avoidance of pressure. In them in a very short time from the commencement of paralysis, vesicles begin to form, leading to infiltration of the surrounding tissues and ending in sloughs. These sores often extend to muscles and bones. In cases of hemiplegia due to cerebral apoplexy bed sores are extremely common. Similarly the affection is very frequently met with in cases of injury to the spine, and especially when the posterior cornua and central portion of the grey matter are affected.

Muscles.—Peculiar atrophic changes of the muscles follow injury or lesion of the brain and cord. Motor paralysis may be due to lesion of motor nerves, to affections of the cord involving the anterior cornua, and rarely to disease or injury of the brain. In acute cases the muscles lose their healthy texture and become flabby, they waste and undergo degenerative changes. They also lose their contractility under the influence of the electric current. In a majority of cases of paralysis, the paralysed muscles are otherwise healthy in their tone. In paralysis due to disease of the cord, the atrophic changes are most common. Thus we find the paralysed muscles more or less wasted in locomotor ataxy, and disseminated sclerosis and infantile paralysis. In muscular atrophy due to disorders of the brain, we invariably find some mischief in the cord, that is, the cord becomes secondarily affected.

Joints.—The affection is synovitis, it is often associated with atrophic changes in the paralysed muscles of the limb affected. It is not so common as one might suppose; but it is sometimes met with in cases of hemiplegia due to softening, and also in paraplegia due to injury to the spine and from caries. In locomotor ataxy, at the onset of the symptoms of inco-ordination, the synovitis appears. The joints mostly affected are the knees, shoulders, and elbows. In this disease there is effusion into the joints with destruction of the surfaces, and possibly dislocation.

Viscera.—The chief are the kidneys and bladder. The symptoms are connected with lesions of the spinal cord. In paraplegia the patient often suffers from purulent, bloody, or ammoniacal urine. This is due to the fact that the urine after a time accumulates in the bladder, sets up irritation of the vesical mucous membrane, and further decomposition.

Reflex effects or consequences of lesions of the nerves.—Lesions of centripetal nerves are capable of producing by a sort of reflex action, changes or mischief in the area of distribution of the centrifugal nerves. Thus, injury to the sensory nerve, as by draughts of cold air, leads to tetanus; irritation of worms, and of dentition in children leads to convulsions. Hysteria is common in girls and may be due to ovarian or uterine irritation. Paraplegia is often a sequela of chronic Bright's disease.

Symptoms relating to diseases of the chest.

The local symptoms relating to the diseases affecting the respiratory system consist of disordered respiration, pain in the chest, cough and expectoration.

Mechanism of respiration.—Disordered respiration.—Respiration consists or two successive movements of inspiration and expiration, followed by a pause. In health during inspiration the chest expands from above downwards, in the antero-posterior, and in the transverse directions. The vertical expansion is always the greatest and is caused by the descent of the diaphragm during its contraction. The horizontal enlargement is due to the muscular action of the external intercostals causing elevation of the ribs and consequent projection forwards of the sternum. During expiration the elasticity of the lung comes into play, and the thorax resumes its former dimensions.

Normal respiration varies with the height.—For every additional increase of an inch in height from five to six feet, there are eight additional cubic inches of air taken in at each ordinary inspiration. The vital capacity of the chest signifies the number of cubic inches of air given out during forcible expiration following deepest inspiration. The vital capacity includes supplemental air, tidal air, and the complemental air. It does not include the residual air, which the lungs cannot get rid of by any expiratory effort. The residual air is estimated in a man of average height to be 100 cubic inches. The supplemental air, or that which remains in the chest after ordinary expiration may also be estimated to be 100 cubic inches. The vital capacity of air in a healthy person is supposed to be 250 cubic inches. The tidal or breathing air passes out of the lungs during ordinary expiration and enters into the lungs during ordinary inspiration. It measures from 26 to 30 cubic inches. The complemental air is that portion which the lungs can accommodate after deep inspiration. It is computed to be about 100 cubic inches.

Any serious diminution in the amount of vital capacity denotes disease of the respiratory system. The changes, if any, are best measured by an instrument known as the spirometer. The vital capacity is greatly diminished in all diseases of the respiratory organs in which the expansibility of the chest is interfered with, as in pleurisy with effusion and in empyema.

Disordered respiration.—In altered breathing the symptoms relate to deviations in number and to disturbance in rhythm.

Deviation in number.—The normal number of respirations in a healthy male adult when at rest is from 14 to 18 in a minute, it is rather more in women and children, and in the new-born child it amounts to 40 or more. It is also high in old age. Respiration may be increased in frequency and in depth. In disease, the dilatation of the alæ nasi and of the rima glottidis with each inspiration indicates an increase in depth.

Increased number of respirations.—Frequency of respiration is met with in cases where the inspiratory muscular movements are interfered with. It occurs in diseases of the kidneys and in other morbid conditions of blood, as cyanosis. It is observed in some cases of disease of the spinal cord. In pyrexia, as occurs in acute inflammatory diseases, in fevers, and in cases where the circulation is excited, as by mental emotion or by physical work, the frequency is altered, *i.e.* is increased. In chest diseases, the inflammatory products or thickening of the bronchial membrane interfere with the proper entrance of air, and therefore the respirations are frequent. Thus it occurs in pneumonia, phthisis, pulmonary œdema, and in capillary bronchitis. In pleural effusions the increased frequency is due to pressure of the fluid upon the lung. The respirations are frequent in hysteria though the pulse may be normal. By exercise, the use of stimulants, and in acute nervous disorders, they are increased. The respirations are also frequent in cases where the respiratory movements are interfered with. This occurs in abdominal pain and in peritonitis with effusion, in the course of abdominal tumours, in enlargement of the liver and in pregnancy. Very often in cases of pain in the costal muscles, or where the muscles of respiration are paralysed and the movements of the diaphragm restrained, the respirations become more frequent.

The respirations are slow in bronchial spasm or asthma; this is owing to some obstruction in or narrowing of the smaller bronchi. In bronchitis affecting the large bronchi the aëration of blood is not interfered with, and hence the respirations are not altered as regards frequency. They are interfered with and even diminished in frequency in fatty degeneration of the heart, as occurs in old age and in confirmed drunkards. In narcotic poisoning they are slow, and the pause is prolonged.

Dyspnœa.—Where the respirations are extremely frequent and the patient has a painful sense of struggle and of a want of air, he is said to suffer from dyspnœa. When the suffering is severe and the want of air so great that the sufferer has to keep in the erect posture, orthopnœa is said to occur. Dyspnœa is a prominent symptom in acute disease of the lung, as pure pneumonia, pure tubercular phthisis, and may be due to a variety of causes. Of these the chief are a poisoned state of the blood, paralysis of the muscles of inspiration, obstruction to the passage of air into the lungs from any cause, diseased condition or imperfect aëration of air cells. The symptom is common in poisoned states of the blood, as cholera, and in croup the false membrane obstructs the passage of air into the lung, and dyspnœa results. In pleuritic sero-fibrinous effusion the product presses upon the lung-substance and diminishes the aërating surface. Similarly dyspnœa occurs in diseases of the bronchi and lungs, as in chronic bronchitis, dilated bronchi, emphysema, pneumonia, phthisis. In cancer within the chest, in enfeebled heart, in aneurism of the thoracic aorta, pressing upon the respiratory passages, and in ascites it is almost always present. Chronic lung diseases due to irritating gases and the inhalation of irritating substances give rise to it.

Disturbance in the duration of respiration, or irregularities in rhythm.—This relates to the duration of inspiration and expiration, and to the completion of the respiratory act. The inspiration may be short, or prolonged, or of irregular duration. Short breathing occurs in hysteria and in cases where one side of the chest is filled with fluid. The breathing is impeded in tetanus and hydrophobia.

Short breathing is also due to the interference with the proper entrance of air. Thus any obstruction in the fauces gives rise to palatal stertor or snoring. The snoring is due to the extreme relaxation of the velum palati. There is vibration of the soft palate owing to the passage of the air through the mouth and nose. The air is admitted behind and in front of the soft palate. Snoring often occurs in persons who sleep with their mouths open. Similar irregular inspiration is found in cerebral concussion, opium poisoning, apoplexy, and in drunkenness.

In these cases the breathing is slow and stertorous owing to the paralysis of the respiratory passages through which the air has to pass during inspiration. Slow breathing can be produced at will by keeping the mouth partly open and then inspiring deeply through the nose. In children and also in adults with large tonsils, owing to obstruction to the entrance of the air, slow breathing with stertor occurs.

When obstruction takes place to the passage of air through the larynx, the stertor is known as stridor. This generally occurs when from some cause, the glottis is partially closed. The partial closure takes place in cases where the larynx is irritated by a foreign substance in contact with the vocal cords. In such cases the inspiration is stridulous. In cases of paralysis of the posterior crico-arytenoid muscles, the glottis is partially closed, the vocal cords are unable to vibrate and stridor is produced. In chloroform poisoning the same thing occurs. In whooping-cough and in laryngismus stridulus there are several short inspirations. In croup the inspirations are peculiarly crowing.

The inspiration is short in duration.—This occurs in œdema of the glottis. It is short but quick in pulmonary emphysema, in acute cerebral diseases, in fevers and in hysteria. The expiration is prolonged in emphysema and in bronchial spasms (asthma).

Irregularities in the respiratory acts.—The respirations may be either thoracic or abdominal.

Abdominal respiration.—In acute pleurisy, in pleurodynia, and in diseases of the spinal cord (between the origin of the phrenic and intercostal nerves) the respiration is chiefly abdominal.

Thoracic.—In peritonitis or in other abdominal affections it is generally thoracic. During health the respiration is always more thoracic in women than in men. Various other irregularities in the respiratory acts are often observed. Thus in hysterical girls there is often noticed a series of several short inspirations increasing in force and length till the patient lies breathless; after a time a low inspiration follows, and then a succession of several others when the patient cries and relief is obtained. This condition is very common among young girls in India. Another important symptom relating to disorders of the respiratory act is hiccough. Hiccough is caused by a sudden and spasmodic descent of the diaphragm at a time where the glottis is imperfectly opened. It is a catching noise produced by the passage of air over the vocal cords. During normal inspiration the diaphragm descends, posterior crico-arytenoid muscles contract, and the vocal cords separate. During spasm of the diaphragm or its sudden descent irrespective of the respiratory need, the vocal cords do not separate and the hiccough is produced. Hiccough occurs in cases of over-distended stomach, and in children who are subject to convulsions. Any irritation of the phrenic nerve on the under surface of the diaphragm, as occurs in peritonitis, or of the phrenic trunk, is liable to produce hiccough. The same symptom is also noticed in some diseases of the brain and is often of grave import in the last stages of fevers.

There is a peculiar form of dyspnœa, known as Cheyne-Stokes respiration, from the names of the authors who have specially described it. In it there is a pause lasting from quarter to one minute, during which respiration is suspended, this is preceded by several inspirations, at first short and shallow, then deeper, and finally of a dyspnœal character. When the dyspnœa has reached its acme, the respirations become more and more superficial, and at last cease as above mentioned. After the pause the symptoms are repeated in exactly the same way. The whole series of phenomena occupies from one to one and a half minutes in severe cases. In mild cases it lasts only a quarter of a minute and may easily be overlooked. This form of dyspnœa is rare in the early stages of any disease; it is most common a few hours before death, and is generally a fatal indication. It occurs in some diseases of the heart, those which cause the supply of arterial blood to become diminished, and especially in diseases of the brain which give rise to compression in the neighbourhood of the medulla oblongata. It is also met with in other affections, such as diseases of the kidney, in the course of which cerebral complications arise.

Cough is an important diagnostic symptom. It consists of three factors:—1. Deep inspiration; 2. Closure of the glottis; and 3. A forcible expiratory effort by which the glottis is suddenly opened by the compressed air. It occurs whenever there is an effort made to dislodge any irritating matter, such as excessive secretion or any foreign body which may have lodged in the throat, larynx, bronchi, or air-cells. In the act of coughing the diaphragm is relaxed, and thus the abdominal muscles are enabled to expel the air from the chest through the forcibly opened glottis. The nervous centre implicated in this act lies in the medulla oblongata. Coughing is a reflex act and is excited by any irritation to the respiratory branches of the vagus, distributed to the respiratory passages, to the lungs, and also to the pleuræ. Inflammation or irritation of the meatus auditorius internus also causes coughing. Cough is a pre-eminent symptom in diseases of the respiratory passages. It may be also due to irritation of the liver or spleen, or to intestinal irritation as by worms, to derangement of stomach, or to enlarged tonsils, or may be simply a hysterical or nervous disorder. Cough is *dry* when auscultation gives no evidence of liquid in the air passages. It is *moist* when liquid is present, *loose* when there is profuse expectoration. The act of coughing may be involuntary or voluntary. A short dry hawking cough is often a pathognomonic symptom of incipient phthisis or of acute or chronic pleurisy, but elongation of the uvula often causes a similar cough. When of a nervous, sympathetic, or hysterical character, the cough is generally dry and hollow, and resembles the crowing of a cock, or the barking of a dog. In pertussis, it has a characteristic whoop during inspiration, due to spasm of the glottis. The inspiration succeeds a series of expirations, and is paroxysmal or spasmodic, and often occasions vomiting. The cough is brassy, ringing, or barking and hoarse, in the early stage of croup, it is whistling in advanced stages. In early bronchitis it is short, restrained and painful, and accompanied by a feeling of soreness in the throat and behind the the sternum. It is soft, deep and loose in chronic bronchitis. In pneumonia it is short and sharp. It is deep and distressing in confirmed phthisis, or when cavities exist. In acute pleurisy, in pneumonia, and in pleurodynia or intercostal neuralgia the cough is short, dry, and restrained, owing to the pain attendant on the patient's efforts. Cough is violent when any tenacious sputa obstruct the air passages and cannot be coughed up readily. It is sonorous and ringing, owing to the narrowing of the bronchi or to the vocal cords being brought together. In laryngeal affections it is hoarse and husky or stridulous. In spasmodic laryngitis the cough is metallic (brassy), ringing.

Expectoration.—Expectoration may contain mucus, pus, or blood. In catarrh and in early bronchitis, in the first stage of pneumonia, and in incipient phthisis, the expectoration is simply mucus. In chronic bronchitis and in confirmed phthisis it is purulent, or mucopurulent. In the second stage of pneumonia it is rusty. It resembles prune-juice in the third stage of pneumonia. In advanced stages of phthisis with cavities it is nummular and heavy. In gangrene of the lungs the sputum is putrid. In diphtheritic inflammatory exudations, and in phthisis with caseation, and in strictures of any part of the respiratory tract, calcareous matter, pus, blood, or sometimes shreds of membrane or of the lung tissue are found in the expectoration. Similar concretions are often found in the follicles of the tonsils, and sometimes expectorated or expelled by coughing. The tonsil concretions are unctuous to the touch, they readily break up under pressure, and have a very disagreeable odour. The expectoration is sometimes black; this form is common in workers in mines and in those whose avocations lead them to inhale air charged with minute particles of dust of various substances, as iron, wool, cotton, &c. Sanguineous expectoration occurs. It may be from the lung, bronchi, trachea, or the larynx. It is frequently an early symptom of phthisis and often occurs in the course of the affection. It is also a symptom of hæmorrhagic infarction of the lung due to disease of the mitral valves. As a bronchial discharge it may be vicarious in cases of suppressed or deficient menstruation; it sometimes occurs in bronchiectasis and in emphysema. Hæmorrhage from the lung also occurs in the hæmorrhagic diathesis, purpura, scurvy, and yellow fever. In mitral disease of the heart, in rupture of an aneurism, and in after injuries to the chest it is also common. Currant-jelly-like sputa are characteristic of cancer of the lung. When the expectoration is profuse and serous it is known as bronchorrhœa. This kind of sputa is common in œdema of the lungs associated with bronchial catarrh. False membranes formed in the larynx, trachea, and pharynx, are often found in the expectorations in true croup and in diphtheria, where the termination of the disease is favorable. Cylindrical fibrinous casts of the bronchial tubes are often expectorated in diphtheria, where the membranous exudation has extended downwards from the throat. Microscopic examination of the sputa in cases of phthisis with cavities often reveals the presence of elastic fibres from the lungs, showing destruction of lung structure. The quantity of expectoration varies greatly in different complaints. It is sometimes enormous in bronchiectasis. In this condition the sputum accumulates and is brought up only at long intervals. The fetid odour and the periodical evacuation serve to distinguish the secretion in these cases from that of phthisis.

Symptoms connected with the circulatory system.

These relate to diseases of the blood, the heart, and of the great vessels.

Derangements of the blood.—Symptoms relating to diseases of the blood.—Any deviation from the healthy condition of the blood may give rise to disease. . Blood is liable to be deranged by:—1. A disproportion in the amount of its constituents; 2. The introduction of poisons from without; 3. The retention of effete products or of poisons absorbed from the body.

The blood receives its several constituents from three different sources:—1. Atmospheric air through the air cells of the lungs; 2. Food (primary digestion) through the alimentary canal and lymphatic system; 3. Metamorphosis of tissues. Blood is useful in forming materials which build up tissues, form secretions, and produce excretions. Its principal constituents are:—Water, 784 parts; albumen, 70 parts; fatty matter, and salts, 1·56 parts; fibrin in solution, 2·2 parts; red corpuscles, 130 parts, in 1000.

Physical characters.—It is a thick and heavy albuminous fluid, of a bright scarlet colour when flowing from an artery, and of a deep claret when flowing from a vein. It consists of a transparent yellowish liquid, called liquor sanguinis, and many red and a few larger white corpuscles. The liquor sanguinis is made up of serum holding fibrin in solution. The specific gravity of blood varies from 1050 to 1059, the temperature is 100°, the reaction alkaline. The acid reaction of menstrual blood is due to the admixture of the acid mucus of the vagina. The quantity of blood in the body is to the weight of the body as one to thirteen. It varies according to the amount of food and drink and to the quantity of water given off.

Disproportion in the amount of its constituents.—The quality or composition of the blood is liable to changes. Thus the *specific gravity* is reduced in anæmia, albuminuria, scurvy, and gout. It is increased in plethora, and in diseases attended with copious watery discharges, as cholera and diabetes.

Red corpuscles.—When the red corpuscles are in *excess*, as in plethora (polycythæmia), all the vital functions of the organs and tissues of the body become accelerated, and persons so affected are very apt to suffer from active hæmorrhages. They are *deficient* in simple anæmia, in chlorosis, in pernicious anæmia, in Addison's disease, in lymphatic anæmia, diabetes and scrofula ; in those who are ill-fed, who confine themselves in close, dark, and ill-ventilated rooms, or breathe impure air, or suffer from exhausting diseases, or expose themselves to the influence of malarial and other poisons. They are also diminished in number in leukæmia, where the white corpuscles are relatively and absolutely increased.

White corpuscles.—White corpuscles are *abundant* in leucocythæmia, although the red corpuscles may be proportionately diminished. The microscope is the only guide in determining the number of corpuscles in the blood. The relative number of the corpuscles in a specimen of blood may be thus accurately estimated : a measured drop of blood is mixed with a given quantity of a saline solution, and placed on a microscope slide with a ruled scale. The number of corpuscles in each square of the scale can easily be counted and compared with the number present in normal blood, estimated by the same method.

The quantity of *fibrin* is increased in persons who are well fed, and during their growth and development. It is also increased in acute inflammatory diseases, in acute rheumatism, during pregnancy, and in phthisis ; but is diminished in adynamic fevers, in hæmorrhages, in purpura, and in cases of death by asphyxia. In all these latter cases the fibrin is unusually watery, and very imperfectly coagulable ; its quantity may fall as low as one part in 1000. *Albumen* is in excess in the blood-serum, in fevers, acute rheumatism, pleurisy, tubercular diseases, chlorosis, and apoplexy; and is diminished in general dropsy and kidney diseases. *Water* is extremely reduced in quantity in cholera, and is proportionally augmented in cases where the red corpuscles are diminished.

In the introduction of poisons from without is another source of derangements of the blood. Thus chronic alcoholism is a morbid condition due to the introduction of alcohol poison into the blood. Similarly opium and other narcotics, and even lead, are the cause of various affections. The contagia of smallpox and of other infectious diseases are morbid poisons introduced into the blood from without the body, although their presence may not be demonstrable. Other morbid conditions of blood involve the retention of effete products, or of poisons absorbed from the body. Thus in the affection known as uræmia there is retention of urea in the blood. Similarly in jaundice (cholæmia), bile pigment is retained, or is reabsorbed into the blood. In pulmonary congestion, and other diseases which occasion apnœa, carbonic acid is retained in the blood, which is also deficient in oxygen. In gout the uric acid is in excess, and in diabetes mellitus (glycohæmia) sugar is found in the blood.

Symptoms relating to diseases of the heart.

Two classes of symptoms, as distinguished from physical signs, are referred to the heart. These are :—1. Disturbance or irregularity of the normal functional activity of the heart, or its objective or visible pulsation, as well as alterations in the number or frequency of its beats. When the action is forcible and rapid the affection is known as palpitation. In functional disorders, as in chlorosis and anæmia, this disturbance (palpitation) is vividly marked, the patient makes an effort and feels apprehensive of its danger. The sensation is due to a perverted state of *innervation*, and is the result of laborious contraction of the heart. Another symptom referred to the heart is a painful sense of pulsation in the region of the heart. The beat jars against the chest, like the blow of a hammer. This, coexisting with forcible and rapid action often indicates valvular or other organic disease of the heart. Thus palpitation is common in a dilated heart. When the dilated heart becomes hypertrophied, the palpitation may cease for a time but it returns again when the hypertrophy begins to degenerate. In degeneration of the heart without dilatation and hypertrophy, as in general marasmus, palpitation is common.

Another variety of irregular action is *rapid action* of the heart. This is common in endocarditis and pericarditis. In both diseases the rapid action is partly due to the coexistent symptomatic fever and partly to the proximity of the inflamed membrane to the muscular substance of the heart. In valvular diseases the action of the heart is often *regular* both in rhythm and frequency for a long time, till the lesions lead to enlargement of the heart. In excentric hypertrophy of the heart the action is *forcible*, but the beats are not increased in number nor altered in rhythm, and the patient is often unaware of its existence. In organic enlargement or dilatation the heart's action is *irregular*, with or without increased frequency. The action is also forcible, and often causes movements of the dress or of the bedclothes.

2. *Pain.*—Pain in the præcordial region may depend upon organic disease of the heart, may indicate recent injury, or may be simply reflex. The pain, when *acute*, is a prominent symptom of acute pericarditis. In angina pectoris the pain is called heart-pang or breast anguish. Like palpitation of the heart, angina pectoris is a paroxysmal and nervous disorder.

Added to these, other characteristic cardiac symptoms are often met with. These are dyspnœa, with or without cyanosis, and œdema (dropsy).

Dyspnœa, or want of breath, is a marked symptom in certain valvular diseases associated with excentric hypertrophy. It is also observed in cases of dilatation attended with degeneration of the walls. When so extremely severe as to prevent the recumbent posture from being adopted the condition is termed orthopnœa. In such cases dyspnœa is due to retardation of circulation, to over-distension and dilatation of the left auricle, to distension of the pulmonary veins, or increased pulmonary congestion.

Cyanosis.—The engorgement of the systemic venous system leads to cyanosis, as evidenced by the lividity of the face and lips. This occurs in dilatation or over-distension of the right auricle, in mitral disease, and in pulmonary emphysema in which the right ventricle generally becomes dilated. In such cyanotic patients there is also impairment of the functions of the brain, and we find languor, apathy, and fatigue upon slight exertion. All these symptoms are best explained as due to imperfect oxygenation and venous condition of the blood. Congestion of the systemic veins also leads to œdema of the lower limbs, a symptom which becomes most marked towards evening in patients who are moving about during the day. It also leads to dropsy. Besides occurring in disease of the valves and hypertrophy and dilatation of the heart, œdema also sets in when there is dilatation of the right side of the heart secondary to emphysema or other lung affections. In these cases dropsy is due to obstruction to the pulmonary circulation. Other symptoms due to diseases of the heart refer to the systemic venous circulation. These are the effects of the engorgement of the stomach, liver, kidneys, and brain. In mitral stenosis and in regurgitation there is often enlargement of the liver and jaundice. The engorgement of the kidneys gives rise to scanty and concentrated urine, containing abundant urates, albumen, and a few hyaline casts. Engorgement of the brain leads to confusion of intellect and tendency to sleep.

The pulse.—There are two methods of determining the characters of the pulse. One method is by touching the pulse at the wrist by means of the fingers, the other involves the aid of an instrument known as the sphygmograph.

Characters of the pulse.—From an examination of the pulse we are enabled to estimate the state of the action of the left ventricle of the heart (the force of the heart's action), and the facility with which blood passes from the arteries into the veins, or the blood-pressure or tension. It also informs us as to the quantity of blood, as producing fulness or otherwise of the vessels; the state of the coats of the arteries, their flexibility or rigidity; the quantity of soft tissues around the vessels, and, to some extent, the condition of the nervous system.

Abnormal characters of the pulse.—These characters are:—(1) Increased frequency and (2) diminished frequency. Diseases of the heart materially influence the state of the pulse, and a careful examination of the pulse also determines whether the arteries are degenerated or not, and gives further valuable information about the diseases of the heart and vessels.

As a general rule, a frequent pulse represents an equal number of contractions of the left ventricle. Each pulse corresponds with the heart sounds, and with the pulsation felt by the fingers applied to the carotid artery. In various cardiac diseases, and in functional disorders of the heart, the pulse at the wrist is often imperceptible, and the number of beats must then be determined by the heart sounds.

Abnormal characters of the pulse, irrespective of diseases of the heart or vessels, are due to indirect or to physiological causes. The pulse is most rapid in the standing posture, less so in the sitting, and least of all in the recumbent position. It is more frequent in the morning than in the evening, and the frequency is also increased by process of digestion (especially after injestion of stimulating food or drink), and by mental and bodily exercise. The normal frequency of the pulse varies with the age, sex, and peculiarities of the individual; at birth it is 140 to 150, in infancy 120, childhood 100, youth 90, adult age 70 to 85, old age 65 to 75, decrepitude

60 to 80. In females it is from six to ten beats quicker than in males. It may, in exceptional individuals, even in health, be much slower. Thus the pulse of Napoleon I was 40. This phenomenon is often observed in Europeans born on the West Coast of Africa.

Pathological causes.—The pulse is frequent in fevers and in acute inflammations. In these conditions the temperature is also high. The frequent pulse and its variations from day to day indicate more or less danger. A transient frequency is not a sign of danger, as it often occurs from mental excitement or is caused in nervous persons by the presence of a physician. A persistent frequency at 120, as in cases of typho-malarial fevers, denotes extreme weakness of the heart, and the danger of death from asthenia is great in such cases. In chronic diseases, as pneumonia, phthisis, a persistently frequent pulse denotes great constitutional disturbance. In neuralgias which simulate organic disease and inflammation, the frequency of the pulse and the increase of temperature are both absent. The persistent frequent pulse is also a symptom of exophthalmic goitre.

Diminished frequency of pulse may be a normal peculiarity. A sluggish pulse frequently denotes loss of arterial elasticity. The graphic tracing of a slow pulse is characterised by the comparative obliquity of the line of ascent. Diminished frequency of the pulse is noticed after the use of sedatives, as digitalis, aconite, veratria; of depressants, as antimony. It is also observed during convalescence in fevers and from acute inflammations, *e g.* pneumonia. In hepatic colic and in jaundice the slow pulse is a characteristic sign. In compression of the brain, either from congestion or from serous effusion or extravasation of blood, as in apoplexy, the pulse is slow. The same peculiarity of pulse is observed in many cases of fatty degeneration of the heart. The pulse may be hard, tortuous, and non-elastic, owing to some change in the structure of the arterial coats; may be hard and incompressible, owing to the abnormal resistance of the healthy coats to the pressure of the fingers. The pulse is described as incompressible when the resistance is great and the tone and elasticity of the coats increased. The graphic tracing shows an outward curve of the line of descent and an oblique line of ascent. The pulse is soft and easily compressible when both the tone and elasticity are deficient. A soft pulse represents feebleness of the ventricular systole. A full pulse is felt when the artery is large and gives the sensation as if the force of blood from the heart were great; a full pulse may be frequent or slow, hard or soft. The pulse is quick when the contractile force of the heart is sudden and abrupt, as in hæmorrhage. Quickness of pulse also denotes weakness of the arterial tension or relaxation of the small arteries, in consequence of which the blood passes freely into the veins. If with a quick pulse the heart is also excited, the graphic tracing will show a lengthened line of ascent and an increased oscillation in the line of descent, known as dicrotism. It thus represents a feeble ventricular systole alternating with one of greater strength. A quick pulse occurs in the essential fevers and in hectic fevers. The small, regular, bounding pulse, of good strength, is met with especially in aortic stenosis. Jerking, collapsing, thrilling, or vibrating pulse occurs when the elasticity of the large arterial trunk, as the aorta, is destroyed, as in aortic regurgitation, or in aneurism. The pulse is weak, small, and unequal, or irregular, and the impulse strong in mitral regurgitation, and rarely in tricuspid regurgitation, where this is only secondary. It is full and bounding, or rapid and easily compressible, in acute rheumatism. Very thrilling in anæmia, where the blood is more liquid than normal, and in tubercular meningitis. Inequality in the two wrists indicates organic disease, or that either an aneurism or some pleuritic effusion, or a tumour presses over the trunk of a vessel supplying that wrist in which the pulse is feeble. The pulse is undulating where the action of the heart is feeble and the elasticity and tone of the arteries diminished. Visible, short, jerking and tortuous pulsations are very common in different parts of the body in aortic regurgitation.

The pulse is small when the size of the artery is diminished, and there is deficient heart's action. It is also known as thready pulse; this occurs in extreme debility and in chronic diseases, and in cases where death takes place by slow asthenia, *e. g.* collapse in cholera. A small, incompressible, or a wiry pulse occurs when there is no diminution in the force of the heart's action, as, for example, in peritonitis and acute inflammation of the serous membranes. A small, weak, and irregular pulse implies a want of uniformity in the rhythm. It is common in mitral regurgitation. It may be constant or occasional. In it there is a series of regular beats, followed by another series with a more rapid succession; sometimes some beats are relatively strong and others weak. The pulse is then said to be unequal. Irregular and intermittent pulse may be congenital or due to old age, or may be a temporary symptom during the progress of an acute malady affecting the lungs, as pneumonia, capillary bronchitis, pleuritic effusions, or during convalescence from remittent fever. In them the irregularity is due to over distension of the right side of the heart, denoting obstruction to the pulmonary circulation. The pulse is permanently irregular and unequal in organic diseases of the heart, as mitral stenosis, and occasionally in meningitis. Intermittent pulse is a kind of irregular pulse, in which there is a pause in the heart's action, which in a regular pulse would have been occupied by one or more regular beats. Intermittent pulse may be a normal peculiarity when accompanied by a regular pulse. In old age intermittent pulse is often well marked. Dicrotous or double pulse is found in continued fevers, cholera, and some cases of heart disease. It is due to the loss of muscular tone of the arteries, so that the arterial impulse is separated from that of the ventricles by a perceptible interval.

Symptoms relating to diseases of the vessels.

In diseases of the circulatory system we must examine the arteries and veins of different parts. A visible, forcible, and jerking pulsation in arteries exposed to view often indicates aortic regurgitant disease. If there be any difference in the pulse of the two wrists, or there is relative feebleness or suppression of the radial pulse, an aortic aneurism, a thrombosis or embolism, or a tumour may be suspected. It is always wise if one pulse is almost absent to make sure that ligature of the radial artery has not been performed for some injury, &c. The diseases of the vessels, like the diseases of any other anatomical system of the body, are organic, and include, in a medical point of view, inflammation and other structural lesions, as aneurism, thrombosis, and embolism. A bellows murmur is of frequent occurrence over an aneurism; it may be single or double. In anæmia, a systolic murmur over the aorta and pulmonary artery, in both the right and left second intercostal space, close to the sternum, is of frequent occurrence. The impoverished condition of the blood causes a murmur to be heard also in the carotids, the subclavian, and the femoral.

Venous pulse.—It is best observed in the superficial veins in the neck, chiefly on the right side. It is supposed to be due to the regurgitation of blood by the contraction of the right auricle and the right ventricle, the right auricle being hypertrophied and the right ventricle dilated. A venous pulse is suspended by pressure over the neck just above the clavicle, not so if the pulse is arterial. That the venous pulse is auricular is known by its occurring before the carotid pulse; the ventricular venous pulse is generally synchronous with the carotid pulse.

Bruit de diable.—Is a venous humming murmur, best heard in the cervical veins in the neck in front of the sterno-cleido-mastoid muscle. It is most marked in anæmia and on the right side; that it is venous is known by making pressure over the vein just above the point where the stethoscope is applied, and the murmur soon disappears.

In obstruction to the right heart, engorgement of the systemic venous system occurs, as is shown by the fulness of the superficial veins and cyanotic condition of the lips and face. The engorgement may be limited as in phlegmasia dolens; there is thrombosis of the iliac or the femoral vein leading to congestion and œdema of one of the lower extremities.

In cirrhotic liver there is obstruction of the portal veins leading to enlargement of the superficial veins of the abdomen. In aortic aneurism pressing on the superior vena cava, the cyanotic appearance is limited to the head and upper extremities. Similarly, in obstruction of the innominate vein on one side, there is cyanosis of the face and head, and of the upper extremity of the same side.

Symptoms and signs connected with the condition of the alimentary canal.

Disorders of the mouth.—I. *Oral cavity.*—The examination is conducted by inspection and occasionally by the aid of the sense of smell.

Lips.—Inspection of the lips: 1. *Colour.*—In anæmia and leucocythemia they are pale and bloodless. After great loss of blood they appear of a waxy whiteness. In cases of general plethora and in early stages of fever, in acute rheumatism, and in phthisis, they are unduly red. In pneumonia and in severe general catarrh they are often covered with herpes. In chronic bronchitis and in other severe chest diseases, in emphysema, in morbus cœruleus, and valvular diseases of the heart, and after exposure to extreme cold, they are blue and dark coloured. The same appearance is observed in certain diseases of the abdominal organs, *e.g.* ascites and ovarian tumours, which cause the diaphragm to be forced upwards and prevent adequate expansion of the lungs. In the typhoid state, and in high continued fevers, the lips become dry and cracked, and are also covered with dried mucus, evaporated saliva, and food particles, collectively known as sordes. They are often brown, or almost black, in low states of the system. In exhausting diseases, towards the close of life, and in thrush in children, the lips are covered with apthæ. In congenital syphilis cracks are often seen round the margin of the lips.

2. *Movements.*—The movements are diminished or lost in hemiplegia, facial palsy, in bulbar paralysis, and in general paralysis of the insane. In hemiplegia the mouth hangs down on the affected side and is drawn up on the sound side. In facial palsy, on asking the patient to show the teeth, it will be observed that on the paralysed side they are imperfectly exposed, and that the angle of the mouth is drawn over to the sound side. In bulbar paralysis the patient cannot move the lips, and the lower lip droops so as to

expose the gums. In drunkenness the lips are tremulous. In children a drawn or puckered mouth indicates abdominal disorder.

II. *Gums.*—Inspection. Colour. They are pale and swollen in anæmia, and in leucocythæmia, and in Hodgkin's disease. Red in plethora and livid in cyanosis. In scurvy, and in depressed conditions of health from any cause, in mercurial poisoning, and in iodism, the gums are swollen and congested, and bleed when touched. In purpura, profuse bleeding from the gums is common. In lead-poisoning we find a blue line along their dental margins; and copper and mercury cause a redness along the same line. In ill-fed and dirtily kept children during the first dentition the gums are apt to become swollen, and the edges sometimes ulcerate. In diabetes the gums sometimes shrink from the teeth, and the teeth become loose.

III. *Teeth.*—Dentition is delayed in children who are debilitated. In rickets, scrofula, and in tuberculosis, caries or decay of the teeth is common. In congenital syphilis the permanent teeth present a peculiar condition. The incisors and the canines are small, smooth, rounded, peg-shaped or tuberculated, narrow at the free edges, and have a crescentic notch at the margin. They are also striped or ribbed horizontally. These appearances are most marked in the two centre teeth. In low fevers, and in typhoid state of the system, the teeth are covered with sordes. In scurvy and in salivation, they are loose in their sockets. In brain diseases and in worms in children, there is often grinding of the teeth. In purpura, the extraction of a tooth may cause bleeding of an obstinate character.

IV. *Saliva.*—Dribbling of the saliva occurs when the secretion is in excess, as in mercurial poisoning. Increased secretion of saliva also occurs during meals, and as an effect of chewing tobacco and dhatura. In India it is one of a series of symptoms which mark the presence of scurvy. The saliva is increased just before vomiting takes place. Dribbling of saliva is present when there is deficient action of the lips and tongue, as in bulbar paralysis, and in cases where the tongue is unable to move freely on account of some sore or ulcers. Where the deglutition is painful or difficult, as when the throat or the tonsils are inflamed, dribbling of saliva is apt to occur. In idiotic children the constant flow of saliva is common. In fevers, in chronic diseases, and in affections of the throat and stomach, the saliva is scanty, thick, and viscid. In confluent smallpox there is often profuse discharge of saliva.

V. *Breath.*—The odour of the breath. The smell of alcoholic drink often informs the physician as to the habits of the patient. In fevers with high temperature and dry mouth the breath is often offensive.

In typhus its odour resembles that exhaled by the skin; in typhoid cases it sometimes contains ammonia. In scurvy it is foul and fœtid. In inflamed gums from mercurial poisoning the breath has a peculiarly fœtid odour. In indigestion it is often sour. In gangrene of the lung, and sometimes in phthisis, it is putrid or highly offensive. In disordered stomach it has sometimes a fæcal or earthy smell. In diabetes and in pyæmia it is of a faint, sweet odour. The presence of carious teeth, combined with want of attention to the mouth (food particles being suffered to remain between the teeth and to decompose), gives a foul odour to the breath. In chronic inflammation of the nasal cavities (ozœna), the breath has a peculiarly disgusting odour. In cases of copious purulent discharge from the lungs, from any cause, the breath is foul. In scurvy it is also foul. Certain articles of diet, as garlic and onions, assafœtida, and various other drugs, as turpentine, copaiba, sandal oil, and ether, impart their peculiar odour to the breath.

Morbid symptoms connected with swallowing consist of various forms of dysphagia or difficulty of swallowing. It may be due to (1) paralysis or spasm of the pharyngeal muscles, (2) to pain or (3) to mechanical obstruction.

1. *Paralysis of the muscles of deglutition.*—The paralysis of the soft palate and superior constrictor muscles is common as a sequel of diphtheria. In bulbar paralysis, there is loss both of motion and sensation, and the food passes into the larynx or returns through the nose. Dysphagia due to spasm occurs in spasmodic affections of the throat, in hydrophobia, tetanus, and in spinal meningitis; in belladonna poisoning, owing to excessive dryness of the mucous membrane of the pharynx. Ulcer in the pharynx also causes spasm. In young girls it sometimes occurs as a reflex phenomenon, and it is known as globus hystericus.

2. *Pain* is another cause of dysphagia. In acute inflammation of the pharynx, tonsils, fauces, and œsophagus, in chronic ulcerations of the posterior part of the larynx, or of the epiglottis, dysphagia occurs.

3. *Mechanical obstructions.*—These are inflammatory swellings of the fauces, tonsils, and pharynx, cicatrices or stricture of the pharynx or œsophagus due to syphilitic or tubercular ulcers, or to ulcers produced by hot liquids and corrosives. Other causes of obstruction are tumours, malignant or otherwise, of the pharynx or œsophagus; retro-pharyngeal abscess, encroaching upon or narrowing the calibre of the pharynx, tumours of the neck or mediastinum; thoracic aneurism; pericarditis with effusion; exostosis from the vertebræ and carcinoma of the lungs or pleura.

The majority of the symptoms presented by the *tongue* have been already alluded to (see p. 24), but in connection with this organ there are a few more points which remain for consideration. These refer principally to the movements of the tongue and the condition of its surface as regards ulcers, &c.

Protrusion.—The tongue is *imperfectly protruded* in cases of tongue-tie or where the tongue is naturally small. Persons with artificial teeth often do not protrude it properly. The tongue deviates to one side in persons with absence of the lower teeth. In hemiplegia from cerebral causes, and in paralysis of the ninth nerve and in facial paralysis, the tongue is protruded towards the paralysed side. Various other causes interfere with normal protrusion of the tongue. Thus, acute glossitis or ulcer on the tongue is a mechanical cause preventing protrusion. Cancerous, syphilitic, or inflammatory infiltrations, interfere with its free movements. Extreme retraction of the tongue is sometimes practised by impostors. In advanced cases of low fevers, and in the collapse stage of cholera, the tongue, which is dry, cracked, or fissured, is much retracted. In bulbar paralysis, or that due to lesion of the medulla, implicating seventh, eighth, and ninth nerves, the tongue sometimes cannot be protruded.

The non-protrusion of the tongue in apoplexy and in typhus fever, is probably sometimes due to the fact that the patient does not hear the request. In such cases the tongue having been once protruded may not be withdrawn, unless the patient be repeatedly requested to do so. In tubercular meningitis, the difficulty of protrusion increases as the disease progresses. In the last stage the patient ceases to put the tongue out at all.

The movement may be irregular rather than deficient, as in chorea the tongue is protruded in a jerky irregular manner.

Sores, ulcers, and morbid growths.—The marks of bites upon the tongue suggest epilepsy, and are indeed often the only distinct evidence of nocturnal attacks of that disease. Sores on the tongue are common in croupous stomatitis (aphthæ). They are round, often numerous, and either disseminated, or they run into each other. There is no ulceration but only an excoriation. They are commonly seen in weakly children, but they are also apt to occur in exhausting diseases of adults. The patches consist of the spores and mycelium of the oidium albicans. The tongue is also sore, excoriated, and red in anæmia, induced by prolonged lactation, by phthisis, and by defective nutrition. The tongue often presents cracks and fissures in typhoid fever. Ulcers of the tongue are of several kinds. (1) *Irritable ulcers.*—These are excited by the irritation of rough teeth; they are painful and generally multiple. (2) The *dyspeptic ulcer.*—

This is usually situated at the middle of the tongue. There is no hard deposit beneath it. (3) The *syphilitic ulcer* forms an excavation with raised edges and sloughy surface, on the back or sides of the tongue. There are other syphilitic affections of the tongue, viz. mucous tubercles or vegetations, gummata, and an affection of the mucous membrane resembling psoriasis. (4) The *cancerous ulcer* appears on the side of the tongue; its base is hard, and the glands below the jaw are soon affected.

Physical examination of the pharynx and fauces.—The pharynx is a funnel-like portion of the alimentary canal, which receives food from the mouth. It gradually narrows as it extends downwards to join the œsophagus. Physical examination of the fauces and pharynx can best be effected by placing the patient before a full light with the mouth widely opened and the tongue depressed by a spatula. During health the examination reveals the hard and soft palate, uvula, the fauces, the tonsil on each side, and the posterior wall of the pharynx. The posterior wall of the pharynx is formed of highly glandular mucous membrane, the mucous membrane of the pillars and soft palate covers the muscular fibres. In health, the mucous membrane of the mouth is of a rosy hue as far as the margin of the anterior pillars of the fauces, where it becomes dusky and more opaque.

The points to be noticed with regard to the *uvula and soft palate* are their form and thickness, the direction of the uvula, the surface —whether smooth or glazed—the colour, any appearance of œdema, or of abscess, sloughing, ulcers, vesicles, exudations, &c. With regard to the *fauces*, the size and appearance of the opening and its sensitiveness should be noticed. The *tonsils* should be examined with regard to swelling and tenderness externally, their position, distance between them, size, form, consistence, colour, surface — whether dry or moist, smooth or uneven; whether any swelling, abscess, sloughing, ulcers, exudations, &c. In examining the *pharynx* the principal points are the size of the cavity, the thickness of the membrane, its surface—whether smooth or granulated— its colour, exudations on surface, whether œdematous, presence of abscesses, tumours, ulcers, cicatrices, &c.

In acute catarrhal inflammation of the pharynx the mucous membrane, especially of the soft palate, is dark red and swollen. The uvula is elongated, and the tonsils more or less swollen. In chronic catarrh the redness is of a duller and darker tinge. The membrane is often hypertrophied, and presents a peculiarly granular or nodulated appearance. In croupous inflammation there are white or greyish-white patches of membrane on the reddened mucous membrane of the soft palate, tonsils, and pharynx. Their detachment causes no loss of substance. In diphtheritic inflammation, ulceration results where the exudation separates. The tonsils are often the seat of acute inflammation leading to abscess, and of chronic inflammation which causes hypertrophy. Retro-pharyngeal abscess occurs in the connective tissue between the spine and the pharynx, the posterior wall of which latter cavity is pushed forward by the accumulated pus. Syphilitic manifestations in the pharynx occur in the form of catarrh, mucous papules, ulcers, condylomata, and gummy tumours.

Symptoms connected with derangement of the stomach and bowels.

In the affection of the stomach known as indigestion there are certain prominent symptoms which indicate purely functional disorder, and are independent of any organic or appreciable lesion in the stomach or in any other part of the digestive tract. These prominent symptoms are perverted appetite, a sense of oppression in the abdomen, in some cases almost amounting to pain, flatulence, pyrosis, nausea, and vomiting.

Deranged appetite.—Appetite is defined to be a natural desire for food at the proper time and in moderate quantity. Hunger is an uneasy sensation occasioned by want of food. Perverted appetite: It may be *bulimia or voracious appetite.* It occurs chiefly in idiots and maniacs. It is also a symptom of several functional and organic diseases. The habit may be acquired by indulgence; it then causes plethora and disorders of the stomach and bowels; it is sometimes hereditary. It is a common symptom in diabetes and during convalescence from fevers and other acute diseases, and in children suffering from worms, and chronic debility due to diseases of the mesenteric glands. Hydrocephalic children and epileptic persons often exhibit an inordinate appetite.

Anorexia, want of appetite, occurs as a symptom in most acute diseases. It is a constant symptom in fevers and in chronic inflammatory and structural diseases of the stomach. It is also associated with those pathological conditions which are connected with various derangements of the blood, as anæmia, chlorosis, leucocythæmia, and adenoid disease. In carcinoma, Bright's disease, and in phthisis, the emaciation is due, in part at least, to want of appetite. It is also a symptom of functional disorders. Attacks of hysteria, excessive excitement of the mind, sudden fright, violent emotions, all tend to diminish appetite. *Vitiated appetite, depravation of appetite, or pica,* in pregnant women and young girls, sometimes takes the form of an uncontrollable desire for indigestible substances as chalk, clay, charcoal, slate, bricks, tiles, dirt, paper, thread, cotton, sealing-wax, &c. Such articles are often fancied by young hysterical and chlorotic girls in India. In the case of a Parsi lady, suffering from chronic disease of the brain, which terminated in insanity, the patient swallowed mouthfuls of pins, pieces of glass, and beads. The symptom is frequently noticed in idiots.

Another symptom of disordered digestion is a feeling of oppression in the abdomen, and chiefly at the pit of the stomach. This is often the result of a loaded condition of the stomach. It is also caused by the accumulation of flatus in the abdomen, a free use of ices and iced drinks, of spirituous and strong drinks, and by the presence in the stomach of highly irritant or indigestible food. In many cases the sense of oppression amounts to pain. The fermentation of various articles of food in the stomach and bowels leads to pain and feeling of oppression. In old persons with a gouty tendency, the feeling of oppression is extremely common, and when severe is known as gout in the stomach.

In acute and chronic gastritis, there is a distressing sense of fulness or heaviness in the epigastrium, but no acute pain. In gastritis due to irritants or to poison, severe pain is present. In enteritis the pains are of a griping character, and usually subside after each evacuation of the bowels. The pain is intense in inflammation of the peritoneum. It is diffused in general peritonitis, and limited when the inflammation is partial, as in perihepatitis or perityphilitis. In gastric ulcers and in cancer in the stomach, pain is a constant symptom. In ulcers, it is localised, circumscribed, and gnawing. Cancer is sometimes comparatively painless, but when it extends and becomes ulcerated, or sets up local peritonitis, the pain is often very severe. Other diseases affecting the digestive system are also attended with pain. Thus in hepatic colic, in lead colic, in enteralgia, there is intense pain.

Flatulence or tympanites.—It is one of the most common phenomena of chronic indigestion. This symptom is caused by the undue formation and collection of gases in the stomach or intestines. The sensations of the patient, and the efforts to expel gas from the stomach or the rectum, point to its situation. In the stomach, the gases consist of a large proportion of nitrogen and of traces of oxygen and carbonic acid; in the intestines, of carbonic acid, carburetted hydrogen, nitrogen, and hydrogen. Flatulence generally accompanies a sense of fulness and distension of the stomach, and often causes uneasiness or pain. In a majority of cases it is due to fermentative changes which are not controlled by the digestive processes, or to decomposition of the ingesta.

The morbid fermentations include vinous fermentation, causing evolution of carbonic acid; the butyric fermentation, producing carbonic acid and hydrogen; and putrefactive fermentation, causing generation of carburetted and sulphuretted hydrogen. Gastric tympanites may also be due to common air swallowed with the food, or mixed with the saliva, as occurs during rapid eating or imperfect mastication. It is also due to the occasional exhalation of gases, as nitrogen and carbonic acid, from the irritated gastric mucous surface. This occurs during local gastric disorder and during some constitutional affections.

In hysterical girls there is often enormous tympanites, without any indigestion. The tympanites appears and disappears suddenly, and the gases, if rejected, are quite inodorous. It is often accompanied with loud noises due to the movements of the gases. The attacks occur chiefly towards evening and may last for several hours. Flatulence generally accompanies extreme debility, and is a frequent symptom in many acute and chronic diseases. Where flatulence is due to the air swallowed, the gases rejected are odourless and tasteless; in cases of decomposition of food the gas is passed upwards and downwards and is fetid, and is accompanied by nausea, borborygmi, and pain. Where due to exhalation from the irritated gastric and intestinal mucous surfaces, or from both, the gas is expelled through the rectum and has the smell of fæces. If gas is expelled from the stomach some time after food, it is generally acid or acrid, very often along with the gases ejected a portion of undigested food is regurgitated. Flatulence, either gastric or intestinal, may be idiopathic or may be a symptom of other disorders. As an idiopathic affection it is incidental to indigestion, and is met with chiefly when the stomach is empty, or after the process of digestion is completed. It is most troublesome in the morning before breakfast and during fasting. Eructation is a constant accompaniment of flatulence. Among the dyspeptics generally eructation is most marked towards evening or after food. In infants who eat too greedily, or in whom the food disagrees, flatulence is very common. It is a common symptom in children brought up by hand, or during the weaning period. In them it often complicates offensive serous diarrhœa with violent griping pains and emaciation. The amount of gases thus discharged is enormous, and their evacuation is often accompanied by a rumbling noise (borborygmi).

Sedentary habits, sexual indulgencies, all those circumstances which depress the nervous energy, as excessive mental work, anxiety, or grief, those which interfere with the healthy muscular tone of the digestive canal, intemperance in eating, drinking cold fluids, exposure to draughts of cold air while the body is overheated, eating bulky vegetable and fruits prone to undergo fermentation, rapid eating, and imperfect mastication, all tend to produce flatulence. Flatulence is common in inflammatory or organic affections of the stomach, in diseases of the liver, in peritonitis, and in pelvic cellulitis. It is frequent in hypochondriasis. It also frequently ushers in an attack of gout. Asthmatic patients are often warned of the attack by its presence. They also suffer from it during the attack. In low forms of fever, and chiefly in the typhoid form, it is a frequent symptom.

A moderate quantity of gas is naturally present in the stomach. When the air or gas exists in undue quantity flatulence or tympanites is said to result. The presence of gas either in the stomach or the intestines or in both, is known by tympanitic resonance. The increased resonance varies in its pitch according as the flatus occupies the stomach or the intestines. The flatus rising into the œsophagus often produces great uneasiness and distress owing to the spasmodic contraction of the tube at its upper part. When there is contraction of the lower part of the œsophagus, preventing the gas from escaping, or when the stomach is weak or over distended, gas accumulates in the stomach, and is known by a swelling and fulness appearing in the epigastrium and hypochondria, and by the occurrence of gurgling and noises in the stomach. The patient often feels pain, discomfort, or great distress from the sense of distension (gastrodynia), and there is tenderness on pressure. Where flatulence is excessive, the stomach pushes the diaphragm upwards and interferes with its movements, the respirations become embarrassed and frequent, and there is a feeling of oppression in the chest with a sense of suffocation. The action of the heart is also very much disturbed. All these symptoms are relieved by escape of the flatus.

Pyrosis or water-brash.—Dr. Cullen has described it as a " constrictive pain at the pit of the stomach extending to the back, and causing the patient to bend forwards, followed in a short time by eructations, without nausea or retching, of a large quantity of thin, watery, and often insipid fluid, that afford relief.'' In some cases it is expelled by regurgitation only, but generally with vomiting. Pyrosis has been viewed in a majority of cases as a symptom of indigestion, although instances of it are met with where the digestion is known to be rapid and powerful. It is also believed to be a morbidly increased secretion from the stomach. When the mucous membrane is exposed to cold, a sort of catarrhal affection takes place. This occurs generally after a long continued congestion or inflammation of the chylopoietic viscera. It has been viewed even as a symptom of disease of the pancreas itself. In this affection there is severe epigastric pain and vomiting, or eructation of watery mucus, sometimes in small and sometimes in considerable quantity. The secretion is usually almost tasteless and neutral, but sometimes sour. It is alkaline at first, but by mixing with fermenting food it becomes acid. Pyrosis generally occurs in the morning when the stomach is empty and after prolonged abstinence, but it also occurs when the stomach contains materials which favour the secretion of the gastric and other juices. In such cases the stomach contains a large quantity of the secretion which irritates the viscus and causes severe epigastric pain, vomiting, and watery eructations. The complaint ceases for a time after the rejection of these fluids. The vomited matters often contain vegetable organisms or cryptogamic plants, called sarcina ventriculi, and also other forms of fungi, and bacteria. Pyrosis is more frequent in females than in males, and chiefly occurs in women whose menses are very much disordered, or who are pregnant or suffer from leucorrhœa. It is most common after puberty, but it may occur at any age. It is a common complaint among the natives of India and among those who live chiefly upon farinaceous food, as rice, barley, and bulky vegetables, and take no animal food. It is a disease of the poor and the ill-clothed, but the rich are not exempt from it. Long fasting, ingestion of indigestible or irritating articles of food, abnormal secretion of the gastric juice, and the increased secretion of unhealthy mucus, which acts as a ferment, all lead to pyrosis. Excessive study, or mental emotions, or anxiety, by diverting the blood from the stomach to the brain, and excessive fatigue, have a similar effect.

The symptoms come on in paroxysms, usually in the morning and before noon, when the stomach is empty. The patient complains of burning pain and sinking at the pit of the stomach, with a sense of constriction as if the stomach were drawn towards the back. The pain is very severe, often lasts for some time; bending the body forwards usually relieves the pain. It is attended with eructation of a large quantity of thin, watery, ropy fluid, which is generally insipid, though sometimes acid, but there is no nausea, retching, or fever. The symptom often recurs.

Dyspepsia and flatulence, constipation, disordered conditions of the liver and stomach, or some organic or functional disease of the pancreas, coexist more or less frequently with pyrosis.

Acidity is an important symptom of disorder of the stomach. It may arise from acids taken with food, from the generation of various acids in the stomach, as during gastric digestion, or from excessive secretion of the gastric juice. The hydrochloric acid is supposed to be the normal acid in the gastric juice, and with pepsine it forms a solvent menstruum. In some forms of indigestion, saccharine and amylaceous articles of food, exposed to the action of unhealthy mucus or some other ferment, undergo the lactic and butyric acid fermentations. Long detention of food in the stomach owing to pyloric obstruction, or some other structural disease, or the presence of irritants, leads to changes which result in the formation of acids. The source of irritation may be in distant parts, *e.g.* the liver, brain, or lungs, and the stomach becomes disordered in a reflex manner.

Acidity is most common in the aged and the gouty, and in those who indulge freely in rich dishes. In these cases the liver and kidneys are generally congested. The patient complains of an acid taste in the mouth, and there are acid or acrid eructations attended with irritation in the throat and fauces. Everything that is taken turns sour or acrid on the stomach. Vegetables, fruits, sweets, pastry, and rich or fat animal food are the substances which most readily turn rancid or sour on a weak stomach. There is unpleasant burning pain and tenderness at the epigastrium. The abdomen is distended with gases, and the patient often suffers from a short dry cough with oppression in the chest. Acidity is often attended with irritability or depression of spirits, and in many cases with faintness.

Nausea, retching, and vomiting.—Nausea is a distressing sensation, which generally precedes vomiting. In cases of dyspepsia and among pregnant women nausea is a very common symptom. Sickness often follows nausea. Such vomiting or sickness is a morbid action, and consists in the rejection of the contents of the stomach, wholly or in part, by efforts partly voluntary and partly involuntary. In some persons vomiting can be produced by a purely voluntary effort; it may occur without retching. It is often a symptom of organic disorders, or of constitutional diseases, but it much more frequently occurs independently of these or of any serious derangement. Retching is a painful contractile effort to reject the contents of the stomach, and takes place either before the stomach is evacuated or when the organ is empty. It is unattended by any ejection. It is preceded by deep inspiratory efforts, during which the glottis is closed, and some amount of air is drawn into the pharynx and swallowed.

Vomiting is a reflex nervous act. It is excited by causes which act on the stomach, and also on other parts. The air swallowed in retching assists to open the cardiac sphincter, and thus facilitates the escape of the contents. It is introduced into the stomach along with a copious flow of saliva. Just before the act of vomiting the chest is filled with air by a long-drawn inspiration. The glottis being now closed, violent muscular efforts of the diaphragm and abdominal muscles ensue, and the stomach is forcibly compressed between these parts. The muscular walls of the stomach at the same time contract forcibly and repeatedly upon its contents. The cardiac orifice of the stomach is suddenly relaxed by the action of the longitudinal fibres of the œsophagus and the radiating fibres of the stomach; the contents thus escape into the œsophagus and pharynx, and by a retrograde action are ejected by the mouth. The retching or fruitless efforts at vomiting are owing to contraction of the cardiac sphincter. Very often, owing to the suddenness of expulsive efforts, some of the vomited matters are expelled through the nose. To prevent them from taking this course, the neck is extended, the mouth is widely opened, and the posterior pillars of the fauces are drawn close together, as during the process of swallowing.

The appearance of bile in the vomited matters is due to compression of the liver or gall-bladder, and to the retrograde action of the duodenum. The yellow colour of vomited matter at the commencement is due to the mixture of bile with the acid in the stomach, but in prolonged vomiting the acid from the stomach disappears altogether, and therefore the bile vomited is green. When vomiting is the result of contact of irritating substances with the mucous membrane of the stomach, we may assume that the irritation is propagated to the medulla oblongata, and thence to the expiratory muscles. The dilatation of the cardiac orifice is caused, in part at least, by efferent impulses descending the vagi.

In the case of disease of any portion of the digestive canal, or of affections of the liver, or of any irritation affecting other parts of the body, the irritation is propagated through the splanchnic ganglia and the plexuses to the stomach, and through them also to the medulla oblongata, and is reflected by the motor nerves of expiration to the expiratory and abdominal muscles. During a violent fit of coughing, as in pertussis and other spasmodic coughs, vomiting often occurs, and it may be due to peripheral irritation of the pneumogastric nerves. Vomiting which occurs in sea-sickness proceeds from a morbid impression of a depressing character, made at first upon the semilunar and other splanchnic ganglia and plexuses, and thence propagated to the ganglionic nerves of the stomach. Some refer sea-sickness to an undue congestion of the cord.

Vomiting is easily excited in children, and some persons vomit readily, whereas in others the act is effected only by violent efforts or straining. Vomiting, although not one of the ordinary wants of life, yet may often be regarded as salutary. In many cases it removes from the stomach irritating, poisonous, or injurious matters, which if retained would prove hurtful to the system.

In diseases of the respiratory passages, as bronchitis, asthma, and in short dry cough, free vomiting by ipecacuanha or tartar emetic internally, or apomorphia (one-eighth or one-sixth of a grain subcutaneously injected), is generally beneficial. In the invasion-stage of fevers a good effect is often produced by the free promotion of vomiting. In various gastric disorders, as gastric catarrh, and in torpid liver, free vomiting at the commencement is most beneficial. Similarly in cynanche parotidea, and in enlarged tonsils, where the breathing becomes embarrassed, an emetic is often most useful.

Retching with vomiting is often a most distressing symptom in various diseases. The presence of injurious, irritating, or noxious substances, or of diet difficult of digestion, or of ordinary diet taken on an irritable stomach, is often attended with painful vomiting. In severe functional disorders of the stomach, as indigestion from deficiency of the gastric juice and other causes; in various organic diseases, as ulceration, inflammation of the mucous membrane, pyloric contraction; in structural disease of the alimentary canal, exclusive of the stomach, as enteritis, dysentery, peritonitis, or hepatic colic; in mechanical obstruction in any part of the intestinal tract. as from hernia or strangulation, painful vomiting often occurs.

Vomiting without nausea.—It is excited on the least movement, and there is no accompanying tenderness on pressure at the epigastrium. It is a frequent symptom in affections other than those of the digestive system. It is frequent at the commencement of intermittent fevers or in the course of acute febrile disorders, either with or without eruptions. It is constant in scarlet fever in children. It often occurs in various diseases of the brain, especially of the base and of its membranes (meningitis), also in tumours of the brain, and in functional vertigo. Vomiting, with or without nausea, occurs in hysteria, during violent emotion, in tubercular peritonitis, in irritation of the genital organs, as in the early stage of pregnancy, as a consequence of disease of the kidneys (uræmia), and of the passage of a calculus through the ureters or through the hepatic ducts. Vomiting often follows dissipation or intoxication. Owing to a nervous cause many morbid impressions acting upon the organs of special senses will produce vomiting. To this category may be assigned sea-sickness, which is caused by the movements of the vessel or the appearance of the waves, or sometimes by disgusting odours on the ship's deck or in the cabin. In some persons even peculiar movements, as swinging, or the thought of such movements, cause vomiting or retching. Sometimes persons riding in a carriage, with the back directed towards the horses, suffer from giddiness, and vomiting follows.

Vomiting occurs at different times, and in various degrees of severity. When due to inflammatory or structural disease of the stomach it is preceded or accompanied by distressing nausea and pain in the epigastrium. It is generally excited by the ingestion of food. Vomiting when not connected with inflammation or any other structural disease of the stomach, but attributable to the sympathetic relations of the stomach with other organs, or when incidental to a general disease, is attended with little or no pain or distress. It occurs irrespective of the ingestion of food or drink. It occurs in the morning, frequently or habitually, in persons suffering from general debility. It also occurs in confirmed drunkards and gluttons.

In these latter cases the vital force of the stomach becomes exhausted by inordinate excitement, and the liquor or food taken readily undergoes acetous or vinous fermentation. Vomiting may come on directly after the food is taken or after a very short interval; sometimes it occurs two or three hours after a meal. If vomiting takes place immediately or shortly after the ingestion of food, the vomited matters are simply food having undergone little or no change, but mixed with abundant discharge of ropy mucus or the acid secretions of the stomach. When vomiting occurs long after the ingestion of food, the vomited matters appear to have undergone mechanical changes caused by the digestive processes in the stomach, and sometimes those of a chemical character, as the acetic, lactic, or the butyric acid fermentations, or even putrefactive changes. Where food has undergone decomposition or putrefaction, the vomited matters appear frothy and deposit a sediment at the bottom, and have an offensive or fæcal odour, denoting that the digestive function is impaired or altogether lost.

In pyloric obstruction, where the food cannot pass onwards into the duodenum, protracted indigestion occurs. In such cases, and also where the stomach is weak and sluggish in its action, the vomited matters sometimes contain sarcinæ ventriculi and various other fungi. The food accumulates, and the fermented or putrefied matter then discharged by vomiting is enormously large. Where vomiting is intense it is generally accompanied by faintness or giddiness, coldness of surface, pallor of the face, dejected countenance, small, feeble, and irregular pulse. After vomiting the temperature of the surface rises, the pulse becomes full and regular. In still more severe cases extreme prostration follows. In cases of prolonged or persistent vomiting or retching, the vomited matter contains bile in greater or less quantity, the colour of which is at the commencement yellow, but at a later period green. This is due to the regurgitation of bile from the duodenum, and when it occurs vomiting is kept up.

Besides food, various other matters are sometimes rejected in vomiting. These are watery fluids (as in water-brash) mucus, pus, blood, bile, fæces, and even worms. The vomiting of mucus is often noticed in gastric catarrh. Pus is seldom seen in vomited matters, except where an hepatic abscess has burst into the stomach. Sometimes pus in vomited matters denotes ulcers in the œsophagus, or its origin may be a retropharyngeal abscess which has opened into the pharynx. Vomiting of blood, or hæmatemesis, is a symptom of great importance, and is therefore separately treated. Bilious vomiting occurs when the vomiting persists after the contents of the stomach are rejected, but sometimes there is distressing nausea, and vomiting of bile only occurs. Such vomiting frequently occurs in peritonitis and in sea-sickness. Some authorities state that hysteria forms an exception, and that, however violent the vomiting in this disorder, it is never bilious. Fæcal vomiting is a still more violent vomiting; it accompanies hernia and other obstructions of bowels. The matters ejected emit the odour of fæces. It is chiefly the contents of the small intestines that are so ejected. Vomited matters sometimes contain worms (lumbrici), which have migrated from the small intestine.

Eructation or belching is a morbid phenomenon, and, like vomiting, is attended with rejection of gaseous, liquid, or solid matters from the stomach, but unlike vomiting, the matter rises into the mouth without any visible muscular effort. Eructation is a symptom of dyspepsia, and, as a result of impaired digestion, something rises into the throat but without any accompanying nausea. Eructation results from an irregular contraction of the muscular fibres of the stomach, a relaxation of the cardiac end, and a reversed action of the œsophagus without contraction of the abdominal muscles.

The eructation of gaseous matter depends upon the nature of the food ingested. It commonly occurs in persons suffering from flatulence. Sometimes the gas discharged is extremely foul and disagreeable to others. This peculiarity is due to the fact that, owing to defective gastric secretion, putrefactive changes have taken place in the contents of the stomach, and sulphuretted hydrogen is evolved.

The eructation of liquids.—This sometimes takes place during digestion. The fluid is brought up without any effort. It varies much in character and quantity. It may be tasteless, saltish, acid, or bitter, and may be in small or large quantity. In pyrosis it is a tasteless or saltish fluid. In cases of acidity of the stomach, the fluid eructation is extremely sour. In persons suffering from heartburn the fluid rises to the back of the mouth, and is so highly bitter or acrid as to produce a burning sensation in the throat. Infants at the breast often throw up quantities of liquid or curdled milk without any effort.

The eructation of solids, viz. of undigested or imperfectly digested food, is a symptom of some forms of dyspepsia. In hysterical women such eructation is very common ; the food is thrown up without any effort or distress.

An examination of the vomited matters is often of considerable importance in the diagnosis of disease. This is generally made with the naked eye, which, in the majority of cases, is quite sufficient ; in some circumstances, however, it is necessary to have recourse to the microscope. In all cases of obstinate vomiting, the possibility of poisoning should be borne in mind.

Constipation.—The fæcal matters consist of the undigested remains of the food mixed with the products of secretion that have been poured into the alimentary canal. During health the expulsion of fæcal matter takes place once in twenty-four hours. With some persons two or more stools may be passed every day owing to the natural habit, and they experience discomfort should the frequency fail to be observed. With others again, only one stool takes place every two or four, or even eight days, with apparently perfect state of bodily health. The state of habitual constipation is called obstipation ; it is sometimes hereditary.

When the fæces are retained for some time beyond the usual habit there is difficulty in expelling them, and constipation is said to result. Where the dejections are insufficient or the quantity passed is small and the expulsion also difficult, costiveness or transient constipation is said to exist. Constipation is a temporary disorder. It generally accompanies indigestion. In it the duodenum and small intestines are involved in slow action. We find irritability of the gastro-intestinal mucous membrane and reabsorption of the excrements, also interference with the due performance of the functions of the stomach, liver, spleen, pancreas, and intestinal glands, and hence the stools, when passed, are pale and clay-coloured. In habitual constipation the interval between the motions may vary from a few days to even weeks. In this condition there are two important factors : one is paralysis or over-distension, or the deficient muscular power of the large intestines, such as to interfere with the normal propulsion of its contents. This chiefly occurs when there is over-accumulation of fæcal matters. Another important factor is the loss of muscular sense of the presence of fæces. This occurs chiefly in the lower part of the colon or the rectum. There is torpid condition of the lower part of the colon and rectum, and the secretions of the alimentary canal are also defective. The intestinal contents, by a further process of absorption, become more solid, and are thus rendered more difficult of expulsion. Constipation is more common in delicate females than in males. In them it often lasts for several days or weeks. During the interval the elimination takes place by the skin, lungs, and kidneys. Sedentary habits, too much sleep, or luxury, predispose to it. It is common in prolonged lactation and as a result of venereal excesses.

Other causes are various mechanical obstructions, such as worms, intestinal concretions; structural diseases of the walls of the intestines leading to constriction; pressure from without, as of gravid uterus, abscesses, tumours, or hernial protrusions or bands of adhesions; also habitual neglect of going to stool; over-use of astringent articles of diet; abuse of opium; excessive smoking of tobacco; many forms of dyspepsia; various acute and chronic functional nervous disorders and reflex uterine and ovarian irritations. The most common cause is the torpid condition of the lower part of the colon and rectum, either from want of contractile power of the muscular coat owing to atony, or to over-distension of the intestine by gas. Another cause is the defective secretion of the necessary moisture in the lower bowels, owing to which the contents, as in diabetes, by a further process of absorption, become more solid and are thus rendered more difficult of expulsion. Torpid or deficient action of the liver and pancreas, and deficiency of their secretions, also lead to constipation. In lead-poisoning the constipation is due to the muscular coats being in a state of irregular and spasmodic contraction, and offering resistance to the exit of fæces. Constipation is likewise a symptom of many disorders. Fissures of the anus, and sometimes hæmorrhoids, by a sort of reflex irritation cause contraction of the sphincter muscle, and thus produce constipation. Muscular weakness of the abdominal walls (pendulous belly), either from general debility or from defective innervation, or as a sequence of repeated pregnancies, leads to constipation. In infants when, at a very early age, raw-meat juice is substituted for milk, such a constipated habit often follows. The common practice of giving medicine to children for the most trifling ailments, and of administering cordials or carminatives, or other soothing drugs, is a measure calculated to be highly injurious and to cause constipation.

Old age is an unavoidable source of constipation. In old persons all the secretory and excretory operations are sluggishly conducted, there is a natural decay of all tissues and the intestinal activity is also interfered with. In old men also prostatic enlargement is common, and sometimes interferes seriously with the expulsive powers of the rectum.

Constipation also occurs in cases of cerebro-spinal debility and irritability. Thus in epilepsy, hydrocephalus, over-worked brain, and after excesses in venery and in alcoholism, constipation is a common symptom. Cases of cerebral congestion with oppression of the head and flushed face are often the subjects of constipation. In cerebral and spinal paralysis constipation is generally present.

The most common consequences of retention of the fæces are: skin-eruptions, headache, giddiness, palpitation of the heart, and various symptoms of indigestion. The breath is foul, the appetite is deranged. The evacuations are scanty, hard, and pale coloured. Fæces accumulate in the intestines and cause discomfort, the abdomen becomes distended by flatus and fæces. Their undue retention gives rise to numerous other morbid products, which also act as irritants and may set up inflammation followed by ulceration.

Very often fæcal matters are retained in pouches in the colon, though a passage exists in the centre like a canal, which allows one daily evacuation. This irritation often leads to intestinal catarrh which is attended with the passage of mucus or pus; often the passage of hard fæces causes dysenteric symptoms or severe pain about the anus, with straining and the discharge of blood. The retained excrement is also liable to set up decomposition, and thus leads to discharge of gases by the anus, and also by the mouth. In some cases the scybala are long retained in the cæcum and cause obstruction, ulceration, and even perforation of the bowels. In such cases these collections feel like abdominal tumours, which in position and shape resemble the cæcum; they yield to pressure, have a doughy feel, and are dull on percussion.

The effect of constipation upon the muscular coats of the bowel is to weaken, and ultimately to paralyse them. The prolonged retention of fæces leads to more or less dilatation and hypertrophy of the cæcum, sigmoid flexure and colon, and to the absorption of excrementitious products into the blood. As a result the normal secretions become vitiated, and the general functions of the alimentary canal disturbed. The liver becomes deranged, and sallow face and bilious conjunctivæ are produced. The urine becomes loaded with urates. The animal functions are also disturbed, and there is lassitude, debility, headache, giddiness, and dejected spirits. As a mechanical effect of pressure of the retained fæcal matter upon the hæmorrhoidal veins, the return of blood from the rectum is impeded, and hæmorrhoids and hæmorrhages from the rectum result. Disordered menstruation, prolapsus ani, fistula, severe colic and enteritis, are also occasional results of constipation. The distended colon, also, by pressing upon the nerves and vessels of the lower extremities, gives rise to numbness, cramps, and even œdema of the legs.

The violent straining at stool in constipation gives rise to hernia in the aged, and is, likewise, a source of considerable danger in patients suffering from heart disease, or atheromatous changes within the cranium.

Diarrhœa is the opposite condition to constipation. It may be said to exist when the alvine discharges are more fluid, frequent, and copious than those in health, without being hæmorrhagic or dysenteric in character. The condition may be induced by a variety of causes. Increased peristaltic action is often the immediate cause, and this, again, may be due to abnormal irritation of the sensory nerves of the intestinal mucous membrane, or undue sensitiveness of those nerves to contact with substances which form the normal contents of the bowels. However produced, increased peristaltic action forces the contents more rapidly forward, and hence they are expelled before their fluid constituents have been absorbed by the vessels and lymphatics of the intestinal mucous membrane. Diarrhœa varies very much with regard to the intensity of the symptoms. The evacuations may be very few, or so frequent as to follow each other in rapid succession. They are generally accompanied by more or less pain, often of a twisting, gnawing character, and especially felt at the umbilicus. The pains usually subside after each evacuation. Some forms of diarrhœa are unaccompanied by pain. There is usually a feeling of exhaustion and sinking, especially after several evacuations have taken place. Sometimes there are febrile symptoms.

The most common cause of diarrhœa is irritation of the mucous membrane of the bowels. This may be due to causes acting directly, as indigestible food, unripe fruits, imperfectly fermented liquors, acid fermentation of the food, worms in the intestines, &c. Cold is another cause of diarrhœa. A chill, when the body is heated, often brings on an attack, especially in tropical or hot countries. The form of diarrhœa thus induced is of the catarrhal kind; it is often seen in the hill-stations in India, and is called "white diarrhœa."

Diarrhœa may also depend upon hepatic derangement. The secretion of bile may be increased, perverted, or diminished. The first of these forms is called "bilious" diarrhœa. The stools are liquid and yellow, and their discharge is accompanied by considerable pain in the lower part of the bowel. When the bile is of an abnormal character the stools are brown or black. When the bile is diminished the stools are more or less pale.

Diarrhœa is a common symptom of many diseases, as phthisis and typhoid fever. In children it is a common attendant upon teething, and various febrile affections. In another class of cases diarrhœa appears to result from debility and a watery condition of the blood. Some forms of colliquative diarrhœa are due to this cause.

In all cases presenting diarrhœa as a symptom, it is necessary to bear in mind that the real cause may be an accumulation of fæces in the bowels, which acts as an irritant, but is only partially got rid of. It is obvious that the treatment in such cases must be directed towards the removal of the cause, and hence the importance of an accurate diagnosis.

The discharges from the intestines should be examined in all cases of diarrhœa, the points to be noted being their quantity, consistence and form, colour, odour, and the presence of any abnormal constituents. In the normal state, the *quantity* of the fæces depends upon the amount of food taken, and on the proportion of indigestible elements which it contains. In diarrhœa, the quantity is increased by the addition of the secretions, and by the portions of food which remain undigested. In cholera and in dysentery, the discharges mainly consist of the profuse intestinal secretions and transudations. The *consistence* of the stools depends upon the amount of fluid constituents, and this is generally proportionate to the time occupied in passing through the bowel. The *form* of the stools is connected with their consistence, but the condition of the sphincter ani often influences the size and shape of the motions. When this muscle is spasmodically contracted (as occurs in fissure of the anus), the fæces are expelled in thin fragments. The *colour* of diarrhœal motions depends upon the quantity and condition of the bile. In cholera the discharges are eventually quite free from bile, and resemble rice-water. Blood derived from the stomach or the upper part of the intestinal canal causes the fæces to become reddish-brown or black. If the blood comes from the ileum or colon, as in typhoid fever and dysentery, it is passed in a more or less pure state.

Symptoms connected with disorders of the urinary system.

Morbid urine.—The function of the kidney is to remove water and a number of solid effete products from the blood. The urine also contains mucus yielded by the mucous surfaces over which it passes. The morbid changes which it undergoes can be best determined by physical, chemical, and microscopical examinations. With regard to the method of its discharge certain symptoms may be observed. The terms in common use are: *Dysuria* (difficult micturition).—It is usually due to affections which come within the province of surgeons, such as stricture, enlarged prostate, and stone. *Strangury* (painful micturition).—It is due to the same kind of causes, and is also produced by the administration of certain drugs, as cantharides, turpentine, &c. *Ischuria* (retention of urine) and *enuresis* (incontinence).—Both are due to abnormal conditions of the bladder or passages, or of their innervation. *Diuresis* (excessive quantity) may be due to an abnormal condition of the secretion, to nervous influence, to the imbibition of unusual quantities of fluid or diuretic drugs, or to diabetes. *Hæmaturia* (blood in the urine) has its cause in the kidneys, ureters, bladder, prostate, or urethra. It may be endemic, as in Mauritius, or intermittent, as in the course of malarious fevers. *Hæmatinuria* (dark-coloured urine containing hæmatin).—This condition occurs in paroxysms, clear urine being passed in the intervals.

The subjects for inquiry in examining the urine, either in health or in disease, are: the quantity, specific gravity, reaction and general appearance. Among the abnormal conditions are: increase or diminution of the urea, the presence of sugar, albumen, blood, hæmatin, pus, mucus (in large quantity), epithelium, and tube-casts, and the various crystalline and amorphous deposits.

Physical characters of healthy urine.—The *quantity* of urine passed during health in twenty-four hours is about fifty ounces. It may be more or less, according to the increase or diminution of sweat or lung-exhalations, and the quantity of fluid taken. To obtain a correct estimate of the quantity, the urine passed in twenty-four hours should be collected. Normally it is of a light yellow, or sometimes of a deep orange colour; is limpid when passed, and after a time it often becomes opaque and turbid. Healthy urine is faintly acid. This reaction is best determined by means of litmus paper. The acidity is owing to the presence of an acid phosphate of soda. Normal urine is never alkaline unless when passed immediately after food. Urine, however, is often rendered alkaline by the chemical changes which occur before or after its passage. These changes consist in the conversion of the urea into carbonate of ammonia, and this change may take place within the bladder—pus, or mucus acting as a ferment. The specific gravity of normal urine is 1018 or 1020. It is best ascertained by an instrument called the urinometer. A rough estimate of the quantity of solids held in solution may be formed from the specific gravity. The solid matters are increased in the urine first passed in the morning. The specific gravity is higher in summer than in winter, as during summer more water is excreted by the skin and lungs. Diminution the solid constituents below the normal denotes deficient elimination of urea and other excrementitious products.

Chemically considered, normal urine consists of water holding in solution urea, uric acid, colouring matter, and a variety of salts; a slight amount of mucus is also held in suspension.

1. *Water.*—In 100 parts of healthy urine there are about 95·4 o water. An excessive and persistent discharge of urine of less specific gravity occurs, and is known as diuresis, diabetes insipidus, or polyuria. In diuresis the urine contains neither albumen nor sugar, but only an excess of water in proportion to the solid constituents. The water is separated from the blood by mere transudation in the Malpighian bodies into which the renal tufts (glomeruli) project.

The solids.—These are excreted through the epithelium of the tubes. They exist in the urine in a proportion of 45 grains per 1000. The daily quantity of solids passed amounts to 900 grains.

2. *Urea.*—It forms one half of all the solids of the urine. Its quantity excreted is estimated at an average of 493 grains in twenty-four hours. Chemically it is found to be a highly-oxidised nitrogenous substance. Its presence in the urine is due to disintegration and retrograde metamorphosis of the animal tissues, and, in part, to non-assimilation of the nitrogenous constituents of food. It is probably formed in the liver and spleen, and to a slight extent, perhaps, in the kidneys. It thus exists ready formed in the blood, and is excreted by the kidneys.

Quantity of urea.—This is increased with the use of animal food, and also with age, but in old people it is less than in adults. In fevers and in chronic wasting diseases its quantity is also increased, owing to increased metamorphosis and disintegration of tissues generally. It is increased in diabetes, but much diminished in acute and chronic degenerative diseases of the kidney.

Chemical tests.—Urea forms no sediment in the urine when passed. It undergoes conversion into carbonate of ammonia if urine be kept for some time and exposed to air, or a similar change may take place within the bladder if much mucus or pus be present. Urea readily combines with nitric and oxalic acids. If a small quantity of urine be concentrated, and an equal volume of strong nitric acid added, rhomboid and hexagonal plates of nitrate of urea will at once be formed. The quantity of urea present in a given specimen may be determined with sufficient accuracy from the specific gravity. Professor Haughton has published a table which shows the quantity of urea excreted, the calculations being based on the number of ounces of urine passed in the twenty-four hours, and the specific gravity of the whole quantity. Other methods have been devised, but are too complicated for clinical purposes.

3. *Uric acid.*—The average quantity excreted daily is eight grains. It may exist alone, or in combination with alkaline bases. It is a

less oxidised nitrogenous compound than urea. Its quantity is increased during febrile conditions and by the use of nitrogenous food, and by diminution in the activity of the respiratory functions. Hence in most fevers, in advanced cases of gout, and in plethora it is found in large quantities. When in large quantities it is deposited as a brownish powdery substance, or the crystals may adhere to the sides of the glass, or form a layer on the surface of the urine. With alkaline phosphates it forms a powdery pink sediment, owing to an admixture with the colouring matter of urine. When heated the deposit of uric acid does not dissolve. Nitric acid readily dissolves it, and on being evaporated the mixture leaves a pink residue like scales of epithelium, which becomes purple or violet (murexide) on being exposed to the vapour of ammonia. Uric acid is very insoluble in water, but it dissolves freely in weak solutions of the carbonates of potash and soda, and in solutions of borax. Under the microscope it appears in rhombic or lozenge-shaped crystals of various sizes, and yellow or brown in colour. Sometimes the crystals are quadrangular or oval, and sometimes stellate. They vary very much in form.

4. *Hippuric acid.*—The quantity passed in health on a mixed diet is estimated to be fifteen grains in twenty-four hours. It is chiefly derived from the vegetable elements of diet. Plums and apples when eaten increase the quantity of hippuric acid. It is closely allied to benzoic acid, and when this is taken its quantity is greatly increased.

Chemical tests.—The urine is copious, often neutral or alkaline. The specific gravity is generally very low. To detect hippuric acid, evaporate half an ounce of urine to a few drops, add half the bulk of hydrochloric, and set the mixture aside. On the addition of the acid the mixture becomes bright pink. After a few hours the characteristic linear crystals of hippuric acid will appear. Among the Bamas and Hindoos those who live solely on diet deficient in nitrogen (vegetables only) and who take little or no exercise, the quantity of hippuric acid is large, and the quantity of urea is diminished.

5. *Extractive matters.*—These are: kreatine, leucin, kreatinine, and xanthin. They are nitrogenous substances intermediate between proper elements of muscles and urea. Xanthine, cystine, lactic acid, oxalic acid, and various vegetable acids are also found in the urine.

6. *Colouring matter.*—The normal colour of the urine is due to the presence of various pigments, the best defined among them being urobilin. The colour varies according to the degree of concentration.

7. *Mucus.*—Healthy urine contains mucus barely sufficient to form a visible cloud. It is yielded by the mucous surfaces and glands of the urinary passages.

8. *Salts.*—These consist of combinations of chlorine, phosphoric and sulphuric acids, with lime, soda, potash, ammonia, and magnesia. Their total amount averages from three to six drachms. They are formed by the oxidation of the sulphur and phosphorus of the food and tissues, and by the combination of the acids with alkaline and earthy bases, their amount being mainly dependent upon the rate of disintegration. The chlorides are derived from the food. They can be detected by a copious deposit on the addition of nitrate of silver. *A similar precipitate* is caused by phosphoric acid, but the phosphate of silver can be dissolved by the addition of a few drops of nitric acid.

9. *Phosphates.*—These are found in the urine and derived from both the animal and vegetable food. They exist in the blood, saliva, and other fluids of the body. The acidity of normal urine is due in part to the presence of an acid phosphate of soda. The retrogressive metamorphosis of the nervous tissue is another source of supply of phosphates to the urine. Their quantity is increased after severe mental labour, and in inflammatory diseases of the brain.

10. *Indican* is one of the normal constituents of urine. The indigo blue colour of decomposing or morbid urine is due to its presence. It is separated from the urine in the form of glistening blue shreds and films. Indican gives no colour to the urine while in the bladder, but only when it yields indigo as a product of decomposition. It can be detected in the urine by the following method:—Into a test tube containing three or four cubic centimètres of pure hydrochloric acid put twenty drops of urine. If but a small quantity of indican be present the mixture will become of a pale reddish-yellow colour. If there be much indican the mixture will rapidly assume a violet or blue tint.

Source.—Indican is a product of the action of pancreatic juice upon albuminous or nitrogenous substances. A substance so produced is known as indol and has a peculiar odour of fæces. This product indol, if hypodermically injected, gives rise to the presence of indican in the urine. Experiments with prolonged and exclusive milk diet increased the quantity of indican. In cases where the albuminous products were not allowed to pass into the intestine, as in a case of artificial anus, no indican appeared in the urine.

All those diseases in which the hæmoglobin of the blood is diminished, as phthisis, scrofulous bone-diseases &c., are attended with an increase in the excretion of indican. Indican is found in health in about 90 per cent. of cases. There is an increase in dyspepsia, diarrhœa, in typhoid fever, and lead poisoning. In certain nervous diseases as paraplegia, progressive muscular atrophy, epilepsy, &c., and in chronic Bright's disease the excretion is increased. In constipation the increase is owing to retardation of the peristalsis and increased absorption of indol.

Physical characters of urine in disease.—1. *Quantity.*—The quantity of water in urine varies with the season, amount of exercise, and the quantity of fluid taken. It is increased on exposure to cold. A great increase of water in the urine denotes either that an undue quantity of fluid has been taken or that some morbid condition is present. Increase occurs in chronic Bright's disease with granular kidney, in hysteria, and some other nervous affections, in the beginning of fever (cold stage of ague), in diabetes, and in the cold season. The secretion is diminished in diarrhœa, in acute Bright's disease, in the final stages of all diseases of the kidney, in the last stage of fever, and in more advanced diseases of the heart. It is absolutely suppressed in cholera, and in collapse due to diseases of the abdominal organs. Also in acute Bright's disease and sometimes in specific fevers. If during the progress of any acute inflammatory disease an increase in the quantity of urine takes place, after a considerable diminution, it is always a favorable sign.

2. *Specific gravity.*—Diminution of the specific gravity denotes an undue quantity of water without any sugar. It occurs in nervous affections, in diabetes insipidus, granular degeneration of the kidneys, and generally when the urine contains albumen, in the cold stage of fevers, and in collapse. The sp. gr. is increased in diabetes mellitus, diarrhœa, and in most febrile diseases.

3. *Colour.*—The urine is of a pale straw colour in nervous diseases, in diabetes, in granular degeneration of the kidneys, and in the phosphatic diathesis. It is deep orange, but transparent in fevers and especially in rheumatic fever. It is milky when voided in the form called chylous urine, which contains normal chyle, albumen, fibrin, red corpuscles, and molecules of fat. Urine is also cloudy or opaque when it contains pus; as occurs in suppuration of the kidneys, or of a portion of the urino-genital tract, or when an adjoining abscess opens into the urinary passages. It is yellowish, or red or brown, in active inflammations, especially of the liver and in fevers, and may be dark like porter in jaundice and in acute Bright's disease. It is blue when indigo is taken into the stomach, as when given for epilepsy. Pareira, and senna communicate a dark brown colour to alkaline urine. Rhubarb given internally imparts a deep gamboge-yellow colour to the urine. Santonin colours the urine orange. The urine is black in carbolic acid poisoning, an accident not uncommon since the introduction of the antiseptic method. The

quantity of carbolic lotion absorbed by an ulcer is often sufficient to produce urine which, if not black when discharged, becomes so on standing or on addition of a drop of nitric acid.

4. *Odour.*—The smell is due to volatile organic acids. It is most marked when the urine is highly acid. There is a strong ammoniacal odour when it is alkaline from decomposition. It has a sweet smell in diabetes, and when alkaline from lime or magnesia. Copaiba gives it a peculiar odour. Turpentine gives it the odour of violets.

5. *Reaction.*—It may be alkaline or too strongly acid. The urine becomes alkaline after the exhibition of potassa, soda, lithia, or the use of vegetable food. This is due to an abnormal condition of blood. It may be also alkaline when there is general depression of the vital powers, and also when the urine is decomposed within the bladder, owing to the presence of mucus or pus. In many diseases of the bladder, and especially in those in which it is unable to empty itself completely, the urea often undergoes conversion into carbonate of ammonia, and the urine becomes alkaline. Its reaction is too highly acid in acute rheumatism, specific fevers, gout, and the uric acid diathesis generally.

Other variations also exist. Thus the normal constituents of urine may be altered in quantity, or one or more abnormal ingredients may be present.

6. *Urea in disease.*—Being formed mainly in the liver, its amount is influenced by changes in the condition of the hepatic cells, and by the alterations in the activity of the hepatic circulation. It is diminished in hepatic diseases, and notably so in acute yellow atrophy of the liver. The quantity is increased on muscular exertion, and by free indulgence in animal food. It is increased in the acute stage of febrile and inflammatory diseases, and in diabetes, owing to rapid disintegration of the albuminoids of the body. During convalescence from acute disorders, most of the nitrogen of the food being appropriated to the repair of the tissues, the quantity of urea falls considerably below the average. It is also diminished in chronic diseases, in cases where nutrition is interfered with, in convulsions, in paralysis, in various fatal diseases, especially towards their close, and in nephritis and in Bright's disease. In hepatic abscess and in jaundice it is rapidly diminished. It has been demonstrated clearly that the kidneys are purely excretory organs, and that the formation of urea takes place in the liver. It is therefore to be expected that in hepatic diseases which involve destruction of the secreting structure, the formation of urea should be found more or less checked. In obstruction from gall-stones, and in cirrhosis, he quantity is extremely small.

7. *Urinary deposits.*—Urine may be clear when passed and subsequently let fall more or less deposit, or it may be passed in a turbid state and subsequently become clear, or nearly so, owing to the precipitation or deposition of the suspended matters to which the turbidity was due. When deposits occur on cooling they usually consist of uric acid or the mixed urates; turbidity of urine recently passed may be due to the presence of phosphates, pus, mucus, or blood. Urinary deposits are composed of ingredients formed from the metamorphosis of tissues or from the food. They are either crystalline or amorphous. The precipitation may be due to one of three circumstances:—1. The urine may contain substances soluble at the temperature of the body, but insoluble at the lower temperature of the air. 2. It may contain insoluble substances at the time it is passed. 3. The deposit may be due to chemical changes which have gone on in the urine after it has been passed.

(*a.*) *Uric acid in disease.*—Lithic acid or red sand. Excess of uric acid exists in fevers, its amount is also considerably increased by a highly albuminous food. Urine depositing uric acid is generally scanty in quantity and the colour is higher than normal. There is usually an excess of mucus. The deposit takes place in the form of brown crystals soon after the urine has been passed, and the earlier these appear the more serious is their significance. If the deposit takes place four or five hours after emission it is probable that there is no great excess of uric acid. Urine containing urates is clear when first passed, but becomes cloudy on being allowed to stand. The sediment stains the side of an earthenware vessel. The reaction is highly acid, and the specific gravity rather high. The deposit is amorphous and may be white or reddish, reddish-brown or deep amber, it is dissolved on being heated, but is reprecipitated on cooling; it is soluble in alkalies and in solutions of alkaline salts. After addition of nitric acid to the urine crystals of uric acid are formed. This form of sediment is common in persons who indulge in excess of food or in whom too great disintegration of tissues is going on. Various forms of dyspepsia are often accompanied by deposits of urates. In wasting diseases the amount of such deposit is a rough measure of the rate at which disintegration of tissues is proceeding. It is more common in inflammations of serous than of mucous membranes. When it occurs during convalescence from inflammations its presence depends on the absorption of the exudation-products, and in these cases it indicates recovery. In eruptive fevers the deposit of urates is generally observed during defervescence, and its absence suggests an incomplete recovery. In rheumatism and in gout the uric acid and urates are in excess; the deficiency or absence of urates in the urine, especially at the time when the affected joints begin to improve, shows that other joints will soon be involved.

(*b.*) *Oxalate of lime.*—The quantity of urine is increased when this compound is present, but the specific gravity remains normal. The colour of such urine is generally high, though sometimes pale, and its reaction is acid. On standing, a mucous cloud covered by a white layer collects near the bottom, and a few bright specks or fine lines appear on the sides of the glass. These crystals are distinguished from urates by not being dissolved on the application of heat; on warming the urine they are deposited as a white powder of a glistening appearance like diamond dust, and this deposit is soluble without effervescence in all mineral acids, but not in acetic acid. Transparent octahedra, with sharply-defined edges and angles, or dumb-bell shaped crystals, are easily found by the microscope; when viewed in a bright light the octahedra resemble cubes marked with a cross. Oxalate of lime, when of frequent occurrence in the urine, may give rise to the formation of calculi. The deposit may exist alone or mixed with uric acid. Its existence in the urine is attributed to the conversion of the elements of farinaceous food into this substance during digestion. Oxalate of lime calculi are especially common in countries where vegetables form the staple food of the inhabitants.

(*c.*) *Phosphates.*—These are deposited from the urine as amorphous phosphate of lime, crystallised phosphate of lime, and ammoniaco-magnesian phosphate or triple phosphate. In acute diseases of the brain and after prolonged mental exertion phosphates are in excess, in delirium tremens they are deficient in quantity. They form a white or yellowish deposit, and occasionally a pellicle on the surface. They are insoluble in alkalies, but soluble in mineral acids and in acetic acid. They are precipitated by ammonia, and form little masses when the urine is heated. Under the microscope the triple phosphates appear in the form of triangular prisms, and the phosphate of lime as amorphous granular matter, and occasionally in the form of crystalline rods or needles.

(*d.*) *Blood.*—It may be furnished by any part of the urino-genital tract, and its presence in the urine may be due to a variety of causes. When present in large quantity the urine is of a bright red or dark and port-wine colour. Under the microscope abundance of blood-corpuscles may be detected. When the blood is present in very small quantity the colour of the urine is but little, if at all affected, but the corpuscles can always be detected by the use of the microscope. The blood pigment may be present without blood disks. Such cases are described as instances of false hæmaturia or hæmatinuria. Urine containing blood is necessarily albuminous, and becomes opaque on boiling or on the addition of nitric acid. If much blood be present a fibrinous clot also forms after the urine has been allowed to stand. With regard to its source, if the blood comes from the kidneys, the urine has a dull red, a brown, blackish or smoky tint. Injuries and various affections of the kidney, such as cancer, and calculous pyelitis, and Bright's disease give rise to hæmaturia. Vesical hæmaturia is a symptom of calculi and tumours of various kinds; the presence of the blood gives a florid red colour to the urine. Other local symptoms are invariably present.

(*e.*) *Leucin and tyrosin.*—These are deposited in the urine as yellow sediment. The urine is acid, its specific gravity high, it is slightly albuminous and loaded with bile-pigments. Under the microscope the sediment presents needle-shaped crystals. The sediment is found in the urine of persons suffering from malignant jaundice (acute yellow atrophy of the liver), and in a few other diseases.

(*f.*) *Casts.*—Certain cylindrical structures, having their origin in the uriniferous tubes, are of great importance in the diagnosis of diseases of the kidney. The formation and excretion of these structures, to which the term "tube-casts" has been generally applied, do not take place under perfectly normal conditions, but they must not be regarded as positive signs of structural changes of the kidneys; on the other hand, in certain affections of the kidney they are not continuously present, and in others they do not appear at all.

There are two varieties of these forms which represent the waste and detachment of portions of the tubules; the first comprises the epithelial casts, and the second the casts in the strict sense of the word, and these latter assume several characteristic forms.

The epithelial casts appear as tubes formed by the cementing together of the epithelial cells of the tubuli uriniferi. The cells become detached in their connected condition, and are passed with the urine in the form of cylinders. With these may be classified the so-called blood-cylinders, which in cases of hæmaturia originate in the tubuli uriniferi and escape with the urine. They consist of coagulated fibrine, and contain red corpuscles, often in such quantities, that under the microscope they appear almost opaque, some of the corpuscles being, however, clearly recognisable. This latter form is, moreover, always accompanied by a sedimentary deposit of separate corpuscles.

With regard to the nature of "tube-casts," strictly so-called, which appear in various affections of the kidney, there are several points as yet undetermined. This is not the place to enter into a lengthy discussion of the various opinions that have been advanced; it is sufficient to point out that some observers regard the casts as metamorphosed epithelium, others as fibrinous coagula which have undergone certain changes during their more or less protracted sojourn in the tubules of the kidneys, the consequence of such changes being that the various kinds can be clearly distinguished from each other,

1. *Hyaline casts.*—These casts are perfectly homogeneous in structure, clear as glass, and so pale that their outline is distinguishable with difficulty from the surrounding fluid. Their discovery will be facilitated by adding a drop of iodine solution to the preparation under the microscope; the casts will then assume a yellowish colour. The majority of these casts are rather small, but their length is often considerable; some are straight, others curved; their breadth is not always uniform, but they sometimes diminish in size towards one extremity and occasionally become bifurcated. Large specimens of hyaline cylinders are marked by one or more indentations. It often happens that no trace of any granular appearance can be made out in these casts; some, however, are dull and finely granular, or dotted over with tiny drops of fat. These hyaline casts disappear very rapidly in alkaline urine.

2. *Opaque granular casts.*—These appear to consist entirely of masses of granules, they are of a dirty brownish-yellow colour, and are therefore less translucent; under the microscope they appear much darker than the hyaline casts. Many of these casts, which, as a rule, are broader than the latter, are marked by lateral indentations, sometimes at pretty regular distances, as though they were composed of several pieces, or were about to be broken up into such portions. The extremities often appear corroded, as though they were crumbling away.

Between this form and the hyaline casts there are many intermediate stages, among which the *finely granular casts* must be mentioned. These appear as if either abruptly broken off at each end, or rounded off, like a finger, at one extremity; they are sometimes of a uniform calibre and sometimes constricted at one part, or become smaller at one extremity. The granular matter is either equally distributed over the cast or else appears in patches, so that the cast approximates more or less to the hyaline form. It not rarely happens that distinct drops of fat are visible between the granules. These latter sometimes disappear on the addition of acetic acid, but sometimes they remain unaffected by that reagent.

3. *Amyloid casts.*—These are distinguished from the hyaline casts by the marked manner in which they refract the light, and hence they present a shining wax-like appearance; they often have a slightly yellowish tinge. Some very broad specimens occur, which are sometimes straight, sometimes convoluted, and with abrupt ex-

tremities. These casts also exhibit marked indentations, and clefts extending to their middle and even beyond it. They are often accompanied by large globular or irregularly-shaped flakes, which resemble the casts in presenting a brilliant wax-like appearance. Like them also they give the amyloid reaction with solution of iodine. It has been stated that tissues which have undergone the amyloid change become of a beautiful red colour (and not blue) when treated with violet writing-ink which contains methylanilin.

From the tube-casts above described, all of which appear under the microscope as solid cylindrical bodies, structures of another form have been distinguished. These appear as lamellous strips, the borders of which are generally parallel, but with extremities variously divided, or appearing as if separated into fibres, or coming to a point on one side, or, lastly, as if rolled up in a spiral manner. These structures have been designated *cylindroids*; they are usually pale and homogeneous, and neither tubular epithelium nor crystalline structures are found adherent to them. On the other hand, the epithelial cells of the tubuli uriniferi, white and red blood-corpuscles, and amorphous precipitates of the urates, more rarely crystals of uric acid or of oxalate of lime, are often found firmly adherent to the casts above described.

Besides these true casts, there are certain forms which are found also in the sediment of normal urine, and which have been designated as "false casts." Among these are the mucous casts. They consist of coagulated mucus, and may resemble in their contour true casts. They generally contain amorphous urate of soda, which appears as a finely granular opacity, and crystals of uric acid and of oxalate of lime may adhere to them. In the urine of infants at the breast, suffering from uric acid infarction of the kidneys, the microscope reveals also cylindrical bodies consisting entirely of globules of urate of ammonia.

Import.—The formation of true casts in the tubuli uriniferi is, as a general rule, associated with the excretion of albuminous urine; but the quantity of albumen and the number of casts present in the sediment are not always in direct proportion to each other. In diffuse inflammations of the kidney, the large quantity of albumen corresponds with the large number of the casts, whereas the watery urine containing small quantities of albumen, in ordinary atrophy and amyloid degeneration of the kidney, exhibits but few casts; but, on the other hand, cases occur in which, with little albumen, the casts appear in considerable numbers as, for example, in secondary atrophy of the kidney after the cessation of inflammation.

The presence of a large number of pale or darkly granular casts in the urine always indicates an inflammatory condition of the kidneys. Pale casts covered with numerous unaltered epithelial cells from the tubuli uriniferi, accompanied by many coloured or colourless blood-corpuscles, and few, if any, dark granular casts in the sediment, indicate an acute nephritis. If, on the other hand, the dark granular casts, which are often indented, predominate over the pale hyaline ones, the case is one of a chronic affection of the kidneys.

In the albuminuria due to febrile conditions and to congestion, and likewise in simple atrophy, and in the majority of cases of amyloid degeneration of the kidneys, the urine contains but few casts.

The pale, homogeneous, and generally small casts are found in the first stages of albuminuria, accompanied by epithelial or blood-casts, and in cases of chronic albuminuria, in which large quantities of watery urine are persistently secreted, the small and pale casts preponderate over the large and dark ones. The same holds good of ordinary atrophy of the kidney and of the majority of the cases of amyloid degeneration.

The appearance of numerous large casts in the urine is indicative of obstructed secretion in the kidney. The greatest number of large casts, some dark and granular, others waxy, are found in secondary atrophy of the kidney following chronic nephritis, and in some cases of amyloid degeneration. Associated with scanty secretion of pale urine of low specific gravity, these large casts sometimes appear in such numbers in the urine as to form a considerable whitish dust-like sediment at the bottom of the glass. The prognosis in such cases is bad.

The shining waxy casts were formerly regarded as pathognomonic of amyloid degeneration of the kidneys. They have, however, been met with in cases of chronic nephritis, the kidneys on post-mortem examination showing no signs of amyloid degeneration. The waxy casts always indicate a chronic and severe affection of the kidney, and are never seen in recent cases of nephritis or in temporary albuminuria.

It may be remarked that in searching for casts it is not sufficient to make one preparation, but several portions of the urine must be taken, in order that the casts, if present in small quantity, may not elude observation.

(*g.*) *Epithelium.*—In catarrhal conditions of the urinary organs, epithelium forms a copious deposit in the urine, resembling mucus but differing from it by the absence of viscid qualities. Its sources are the bladder, urethra, vagina, and uriniferous tubes. *Chemical tests:* on addition of alkalies the deposit becomes converted into a thick gelatinous mass as when pus is present. The microscope reveals exfoliated epithelial cells, which when distended with fluid are regularly oval, but are irregularly angular and flattened when empty. They also present a well-marked central nucleus.

(*h.*) *Spermatozoa.*—The spermatic fluid is found in some cases mixed with the urine in sufficient quantity to form a cloud, and may easily be mistaken for mucus. The urine is acid, and the deposit is not dissolved by heat or nitric acid. The microscope reveals the presence of semen. The spermatozoa are minute oval bodies, with a delicate bristle-like tail.

Other abnormal substances exist as sediments in the urine; these are mucus, pus, parasites, &c. The excessive secretion of mucus is due to some morbid condition of the pelvis of the kidney, or of the bladder, or the urethra. It has a remarkable influence in the decomposition of urea, and hence urine containing much mucus is especially prone to undergo putrefaction and evolve a fœtid ammoniacal odour. The urine then becomes turbid and alkaline. The deposit sinks, and is viscid, tenacious, and of a dirty greenish-yellow colour. It does not mix freely with the urine after agitation but the urine is made whitish. No albumen is found on chemical examination, the deposit does not become gelatinous by addition of ammonia or potash; acetic acid coagulates the mucus into a thin semi-opaque membrane.

Chyloserous urine is of a milky colour and sometimes pinkish from admixture of blood. *Chemical tests:* it is coagulated by heat, chylous urine becomes clear if agitated with ether, and when the ethereal solution is evaporated yellow oily matter is left. Its constituents are, in addition to the ordinary urinary solids, fibrin, albumen, and sometimes red corpuscles. Chyle corpuscles and granular fatty matter are detected by the microscope.

Pus is found in the urine in suppurative inflammation of the kidney, bladder, or the urethra, or may be derived from the bursting of an adjacent abscess into the urinary passages. The urine is turbid and milky, and after a while the pus is deposited in the form of a yellowish-white or greenish-yellow sediment.

The appearance of the deposit varies according as the urine is acid or alkaline in reaction. In the former case the deposit is loose and the corpuscles are separated from each other, in the latter the pus forms viscid, tenacious, stringy masses. When solution of potash or ammonia is added to pus the mixture forms a viscid mass. The microscope affords the most ready and certain method of detecting pus. The pus-corpuscle is spherical, granular on the surface, and yellowish in colour. Its diameter is $\frac{1}{2500}$ of an inch. On the addition of a little acetic acid the corpuscles become clear, and the nucleus is brought into view. This latter is ordinarily tripartite.

Purulent urine contains more or less albumen, and it is often a point of some difficulty to determine whether the albumen is derived from the pus alone, or whether its presence indicates co-existing disease of the kidneys. The presence of a large quantity of albumen would excite suspicion of renal mischief; the quantity of albumen in pus is comparatively small. The presence or absence of tube-casts would assist the diagnosis.

Parasites.—Bilharzia hæmatobia are found in the urine of patients suffering from the endemic hæmaturia of Egypt and South Africa. Echinococci have been found in the urine in cases of hydatids of the kidneys.

Abnormal substances other than sediments. Sugar.—When found in the urine it is always associated with an increase in the daily quantity, and such urine has a pale straw colour and sweetish smell. The specific gravity is high, 1025 to 1060. After the urine has stood for some time minute fungoid vegetations, torulæ cerevisiæ, appear as a result of alcoholic fermentation. These vegetations consist of oval bodies containing granules in their interior; they enlarge and form jointed tubes of fungoid growths. Under the microscope the torula or yeast fungus is found to be a round, transparent body, nucleated, and $\frac{1}{2500}$ to $\frac{1}{7000}$ of an inch in diameter. It consists of a thin-walled sac containing protoplasm. *Chemical tests: Moore's test.*—Add half the bulk of pure liquor potassæ to the urine and boil; the mixture becomes dark brown from the conversion of the sugar into melassic acid. *Trommer's test or the copper test.*—Add a drop or two of solution of sulphate of copper to the urine and then liquor potassæ in excess. On boiling the mixture an easily detected yellow-brown precipitate of sub-oxide of copper appears, the protoxide being reduced to a sub-oxide. If there be no sugar the mixture will become green before boiling, but after boiling a black precipitate will fall. To render this test more accurate a ready-made solution known as the Fehling's solution should be used. The solution is prepared thus; pure crystallised sulphate of copper 90½ grains, neutral tartrate of potash 364 grains, solution of caustic soda sp. gr. 1·12 four fluid ounces; distilled water to make up exactly six fluid ounces. About a drachm of this solution is poured into a test-tube, heated to boiling and then about half a drachm of the urine is added. It is then reboiled and if sugar be present the mixture suddenly assumes an intense opaque yellow colour, and a copious yellow or red precipitate appears.

Robert's test for quantity.—Ascertain the specific gravity before and after the fermentation, and from loss of density by its conversion into carbonic acid and alcohol calculate the amount of sugar destroyed. Thus:

Sp. gr. before fermentation	1050
Sp. gr. after fermentation	1010
Degrees of density lost	40

The number of degrees of density lost indicates as many grains of sugar in each fluid ounce of the urine.

A neat method of determining the quantity is by means of the polariscope. The urine is rendered colourless by filtering through charcoal. A ray of light from a prism is passed through it, and is deflected by the saccharine solution to the right. The number of turns of the screw required to place the prism so as to make the ray of light straight is an accurate index of the quantity of sugar. Soleil's saccharimeter is another instrument which has been employed for the purpose, but its use involves much delicacy of manipulation.

Albumen is not a constituent of normal urine. It is found in cases where the blood-pressure is increased, and when this increase reaches a certain intensity albuminuria ensues. Thus, it exists in all diseases of the kidneys known as Bright's disease, in congestion of the kidneys, in congestion of the systemic venous system, in dilatation of the right side of the heart due to mitral regurgitation or obstruction, or to pulmonary emphysema, in pneumonia and pleuritic effusions, and in many specific fevers and febrile diseases in which the temperature is high. The pressure of the gravid uterus or of uterine or ovarian tumours on the vena cava inferior, or on the renal veins, also leads to albuminuria. Albumen is also found in the urine of patients suffering from purpura, scurvy and lead-poisoning. It is necessarily present when the urine contains blood, chyle, or pus. A temporary condition of albuminuria may be caused by cold bathing or the use of large quantities of albuminous food. The quantity of albumen present varies. It is large in acute Bright's disease, and generally less in the chronic stages. Albuminous urine varies in colour from circumstances not directly dependent on the albumen. Thus, in acute Bright's disease it is smoky or red owing to the colouring matter of the blood, while in chronic Bright's disease it is paler than natural. The specific gravity is always low except when the total quantity of urine excreted is very small; it varies from 1004 to 1015. Albuminous urine froths notably when passed into a vessel, and also retains the bubbles for some time. *Chemical tests.*—A white precipitate of albumen is thrown down on the application of heat and nitric acid. Heat alone produces a white precipitate if phosphates be present, but the precipitate disappears on the addition of nitric acid. If the urine be alkaline the albumen is not coagulated by heat. A few drops of acetic acid should be added to the urine before boiling.

The urine of patients who have taken copaiba or cubebs for some time throws down a precipitate with nitric acid, but it readily dissolves on the application of heat.

Bile constituents.—The biliary acids or the bile pigments are present in every variety of jaundice, and they produce by reflected light a dark yellow or mahogany colour, the edge of the fluid being for the most part yellow. When bile-pigment is present a violet colour is produced on bringing the urine into contact with a drop of nitric acid, and the violet tint is succeeded by green and red. The colour is due to the presence of a pigment called bilirubin. To demonstrate the presence of biliary acids take one part of urine, add to it one third of its bulk of sulphuric acid and a little sugar, and a violet or purple tinge will appear where the urine meets with the acid. Another test is to add one part of chloroform to ten parts of urine, and agitate the mixture, when a yellow colouring matter will be dissolved out. The presence of biliary acids in the urine is characteristic of jaundice due to retention of bile.

PHYSICAL SIGNS OF DISEASES.

Examination of the Respiratory Tract.

Physical examination of the larynx.

The examination of the larynx is made by inspection and palpation. The interior of the organ is examined by means of the laryngoscope, an instrument by the aid of which we are enabled minutely to observe its condition, and to apply local remedies to any disease of its parts. We detect organic or structural changes in the larynx, changes in the position, shape, and size of the epiglottis, presence of growths or tumours, and paralysis or spasm of the vocal muscles. The apparatus of the laryngoscope consists of a laryngeal mirror which receives the image of the vocal cords, and the adjacent structures. To illuminate the larynx, the rays of the sun, the diffuse light of day, or the light of a lamp may be used. In India the sun light can be generally used instead of the lamp. For reflecting the light of the sun or of a lamp, a concave circular mirror may be used. This should be freely movable in all directions upon its support, or should be such as can easily be adapted to the front of the eye on a spectacle frame, or fixed to the forehead by means of an elastic band. But when sunlight is used, a flat mirror is more convenient. The mirror should also have a central hole of an oval form through which the examiner can look when the mirror is fixed upon the eye. The laryngeal mirrors vary in size and in diameter from half-an-inch to an inch, and are fixed at an angle of 120° to a stem measuring from six to eight inches. A circular mirror is the most useful.

The examination may be thus effected: the patient should be seated in front of the examiner, his head inclined a little backwards; if the lamp be used it should be placed on one side and a little behind the head. The examiner's eye should be at the distance of a foot from the patient's mouth. The mirror should now reflect light on the patient's uvula. The patient should be told to open the mouth wide and to protrude the tongue, which may then be pressed gently downwards by the examiner. The laryngeal mirror, previously warmed over a lamp or by immersion in hot water, is now passed backwards till it reaches the base of the uvula, its surface facing downwards and forwards, at an angle with the horizontal plane of the mouth. Should the orifice of the larynx be not visible, the position of the mirror should be slightly changed, in this or that direction. In this examination great patience and perseverance are required. It is better to introduce the mirror several times in the course of a sitting than to allow it to remain long during one introduction. Care is also necessary that the tongue be not unduly depressed nor drawn forwards and injured by the teeth. During introduction the mirror should not touch the tongue, nor should it unnecessarily touch the palate.

The examination by the laryngeal mirror during health reveals a triangular space, the top of which is the epiglottis, the base being formed by two prominences of the arytenoid cartilages, one at each angle. The sides of the triangle are formed by the aryteno-epiglottidean folds. Thus we may observe the epiglottis and all the boundaries of the orifice of the larynx, the aryteno-epiglottidean folds, the cartilages of Wrisberg, the posterior commissure, the rima glottidis, the true and false vocal cords, the ventricles of the larynx, and sometimes the tracheal cartilages, and even the bifurcation of the trachea. The whole of the larynx except the true vocal cords, which are pearly white, is of the same colour as the mouth, and the edge of the epiglottis with the cricoid and tracheal cartilages are distinctly yellowish. The image being a reflected one, those parts of the larynx observed on the right of the patient are in reality the structures of the left side, and *vice versâ.* The cords are of equal width on either side (one eighth of an inch). The chink between them runs directly in the middle line. During deep inspiration the cords separate widely, and the glottis is fully open. During phonation, or when the patient is directed to utter a vocal sound, as "ah," or "ha," the cords approach each other and meet in the middle line.

In order to notice the vigorous movements of the cords, and to examine the glottis when the rima is fully open and when it is perfectly closed, the patient should be directed for the former to draw a deep breath, and for the latter to utter a vocal sound, as "ah," or "ha."

External examination: palpation.—By it we ascertain the presence of pain on pressure; the displacement of the trachea from its normal position by tumours or any other cause; swelling with induration of the surrounding tissues; and stony hardness and fixation of the larynx from carcinoma or any other cause. In laryngeal tumour there is a vibratile thrill both during inspiration and expiration.

The most important affections of the larynx which admit of detection by the laryngoscope are acute and chronic catarrh, laryngeal phthisis, the various syphilitic affections, perichondritis, œdema, morbid growths of a simple or malignant character, and spasm and paralysis of the vocal cords.

A short sketch of the discovery of the laryngoscope will indicate the improvements that have been effected by its means. It would appear that about the middle of the last century an instrument was first devised for examining the lower part of the throat during life, the main object of the inventor being to facilitate the application of ligatures to polypoid growths. More than sixty years afterwards Dr. Bozzini, of Frankfort, constructed an instrument, which, in a pamphlet published at Weimar, in 1807, he described as a conductor of light. This consisted of a kind of lantern containing a candle, and a metallic tube, or speculum, fitted with a mirror and varying in size according to the organ to be examined.

In order to be able get a view of parts situated at an angle to the line of vision the speculum was fitted with a mirror which could be directed upwards or downwards. The invention, however, was but coldly received; the instrument never came into general use; and in the course of a few years was altogether forgotten. Several other similar attempts were made, but very little success was attained until in 1827 Dr. Babington constructed the instrument called the glottiscope, the use of which he demonstrated to the Hunterian Society. The glottiscope, in its simplified form, consisted of a laryngeal mirror, similar to those now in use, upon which light was thrown by a mirror held in the operator's hand. No practical use appears to have been made of this contrivance, although only a slight modification was wanting in order to convert it into the instrument of the present day. A few years later, an Italian physician stated that by the aid of a speculum and mirror he had obtained a view of the interior of the larynx. Trousseau, in 1837, however, denied the accuracy of the assertion, and wrote disparagingly of the utility of the instrument. Shortly afterwards, Liston recommended the use of a mirror for the purpose of examining œdematous swellings of the larynx. Another English surgeon, Mr. Avery, also constructed a laryngoscope. The next prominent name is that of a French musician, Mons. Garcia, who devised a very ingenious method for auto-laryngoscopy, but his communications and experiments, like those of his predecessors, excited only a temporary interest. It was not until 1857 that the art of laryngoscopy was initiated. Dr. Türck, of Vienna, made use of the laryngeal mirror in his wards, but failed to appreciate the uses of which the instrument was capable. Another German physician, however, Dr. Czermak, borrowed Türck's imperfect instruments, remedied their deficiencies, and, so to speak, created the art of laryngoscopy.

Much benefit has resulted from the use of the laryngoscope. It has enabled us to look into the larynx, to study the movements of its various parts during the production of certain vocal sounds, to detect inflammation, ulceration, tumours, and foreign bodies in the larynx, relaxation of the vocal cords, &c., and to treat these conditions with precision and success. Taking, as an example, the various morbid growths to which the larynx is liable, it is clear that a positive diagnosis was impossible before the introduction of the laryngoscope only twenty years ago. The hoarseness, loss of voice, cough, and other symptoms common to many affections of the air-passages, could not be referred to their real cause. Now, tumours of the larynx can be not only brought to view, but removed with comparative facility, while the danger of suffocation is averted, and the full use of the voice is often restored; escharotics or astringents can be applied to any part that is desired; while relaxation of the vocal cords has in many cases been promptly cured by the direct application of a Faradaic current.

Physical examination of the chest.

The chest is examined by the methods of inspection, palpation, percussion, and auscultation. The frequency of respiration is also to be observed.

Respiratory organs of the chest.—The chest should be laid bare. During the examination of the front of the chest the patient should be made to stand or to sit with the hands hanging down by the side. For the examination of the back a slightly stooping posture, with the head bent forwards and the arms folded across the chest, is necessary. During the examination of the lateral regions the arms must be raised vertically over the head. During examination always remember to notice the condition of the apices of the lungs in front and behind, as well as their bases posteriorly and laterally, the amount of the deposit of fat and muscles, the condition of the ribs and cartilages, and the form and size of the chest.

Division of the chest walls (thorax) into regions.—The chest walls may be conveniently divided for purposes of description into regions. These are named according to their position. Thus, *median*, which corresponds to the width of the sternum, and includes (1) supra-sternal, or the depression above the sternum; (2) sternal, extending from the upper border of the sternum to the lower border of the third cartilage; (3) infra-sternal, that which extends from the third cartilage to the lower end of the sternum.

Antero-lateral.—A region which is bounded internally by the margin of the sternum, and externally by the acromion process on each side. Under this head we find—1. Supra-clavicular, which includes the region extending above from the outer third of the clavicle to the external border of the trachea. 2. The clavicular region behind the inner two thirds of the clavicle. 3. Infra-clavicular, which extends from below the clavicle down to the lower margin of the third rib. 4. Mammary, from the third to the sixth rib. 5. Infra-mammary, from the sixth rib to the lower margins of the thorax.

Lateral.—This region is bounded in front by the acromion line and behind by the axillary border of the scapula. It is divided into—1. Axillary, extending from the apex of the axilla to the sixth rib. 2. Infra-axillary, from the sixth rib down to the lower margin of the thorax.

Posterior.—It is bounded by the axillary edge of the scapula in front, and by the spine behind. It includes (1) supra-spinous or superior scapular, which is limited to the supra-spinous fossa; (2) infra spinous or inferior scapular, to the infra-spinous fossa; (3) infra-scapular, which extends from the angle of the scapula to the lower margin of the thorax below and to the spine behind; and (4) inter-scapular includes the space between the base or border of the scapula and the spinous processes of the spine.

Inspection.—The first observation is as to colour, fat, or œdema of chest walls. The shape and size of the chest is also to be noted, its depressions, the directions of the ribs, and intercostal spaces, and its movements.

Colour.—Dilatation of the cutaneous capillaries occurs in cases of violent action of the respiratory organs, attended with imperfect aeration and stagnation of blood in the pulmonary capillaries. Thus, the healthy colour of the skin of the chest is altered in asthma, and congestion of the lung. Œdema of the chest walls may be the result of long-continued congestion of the lung and of dropsy.

Size and shape of the chest.—The instruments by means of which the size and shape of the chest are measured are a tape and cyrtometer. The cyrtometer consists of two pieces of thin lead pipe, of about a line in thickness, joined together by a piece of india-rubber tubing.

Shape of the chest.—When the outlines are drawn on paper by the help of the cyrtometer, the *antero-posterior* diameter is that which joins the sternum with the dorsal middle point. The *transverse* is drawn through the middle point of this line. In a healthy chest the ratio between these two should be one to one-and-one-third. In the new-born infant the diameters are equal and chest almost circular, the axes of the ellipse being nearly equal. In adults the breadth of the chest is greater by one third than the depth.

Certain other forms of the chest, though not indicating present disease, point to its occurrence in the past or its likelihood in the future. These are called modified or subtypical varieties, and are five in number:

1. *The shallow or alar chest.*—In the shallow chest, the proportion of the diameters is antero-posterior one to transverse one and a half; and, owing to the flatness of the back, the scapulæ often stand out like wings, hence this kind of chest is often spoken of as alar or pterygoid. It is also called phthisical chest, and is indicative of a tendency to phthisis. The chest is narrow and shallow, owing to the greater obliquity of the ribs, which causes depression of the shoulders, and also increases the chest in length. The angles of the scapulæ project. It must always be borne in mind that the primary forces acting upon the chest wall are the pressure of the general atmosphere without, and of the inspired air within. So long as the latter counteracts the former the chest wall maintains its outline. As soon as the pressure is diminished at any point, the effect of the constant external atmospheric pressure is manifested to as great a degree as the rigidity of the chest walls will allow.

2. *Flat chest.*—In this chest the cartilages of the true ribs lose their curve and become straight, the chest looks flat in front, the sternum is depressed below the level of the cartilages, which are wrongly curved. Such a chest indicates predisposition to phthisis.

3. *Transversely constricted chest.*—It consists of deep depression of the chest walls in front, which passes outwards and downwards, on both sides on a level with the xiphoid cartilage. It is due to the want of air to expand the bases of the lungs during childhood. Some degree of this variety often accompanies the other forms.

4. *Pigeon breast.*—In this variety the true ribs are almost straight

in front of their angles. Owing to pressure on them at those points when they are young and yielding the sternum is projected forwards, the transverse diameter of the chest is lessened, and a horizontal section of the chest tends to form a triangle. It is common in rickets, and arises from impediment to free inspiration, and also from the fact of the ribs being unnaturally yielding. The proportion of diameters is one to one and one-fifth. Chronic pulmonary catarrh and whooping-cough also lead to it.

5. *Rickety chest.*—It is partly a transversely-constricted and partly a pigeon-breasted chest. It is common in children, in whom the respiration is chiefly abdominal. The chest at first is of a circular shape, and when the diaphragm descends the air in the lungs becomes rarefied, the ribs yield in their softest places to the atmospheric pressure from without, and are bent inwards, and at the softest parts of the ribs, which are at their junction with the costal cartilages, a depression is formed. Bead-like projections are felt at the junction of the cartilages with the ribs at the lower part of the chest.

Local depressions or contractions of the chest-wall are always caused by the exclusion of air from some part of the lung. In consumption the depression of the supra- and infra-clavicular regions which commonly occurs is due to shrinking of the lung beneath.

Movements of the chest.—In considering the movements of the chest or the respiratory movements, the conditions of the muscles of respiration are important. Their hypertrophy indicates a long-continued exaggerated respiratory effort.

Movements.—They vary according to the height, weight, age, and sex. During health the number of respirations are from 18 to 20. In disease, movements may be absent on one side, or there may be too rapid or too laboured respirations. Dyspnœa is then said to exist.

Dyspnœa, or difficulty of breathing, may be due to the diminution in the extent of the breathing surface, as in pneumonia, phthisis, emphysema, pleuritic effusion, &c.; or to obstruction to the bronchi by catarrh, as seen especially in capillary bronchitis, or to sensation of pain on respiration, as in pleurisy, peritonitis, &c. When one lung is affected so as to be almost useless, the capillaries of the other sound lung carry on the oxygenation of the blood, and breathing may go on at the normal rate so long as the patient is quiet and there are no active symptoms. In disease affecting both lungs, the remaining healthy air-vesicles become strongly distended, and dyspnœa is the result.

Varieties of dyspnœa are due to special perversions in the character of the respiratory movements. These are:

1. *Inspiratory dyspnœa.*—This is noticed when the chest-walls are yielding. It occurs in obstruction to the entrance of air into the lungs, as in spasm or stricture of the larynx or trachea, in œdema of the lungs, in hydrothorax, and in pulmonary catarrh in rickety children.

2. *Expiratory dyspnœa.*—In this variety the expiratory movements are exceedingly prolonged and laborious. It may be due to impediments to expiration in the upper air-passages, and occurs also in cases where the expiratory power of the lung is diminished, as in emphysema, congestion, asthma, &c.

3. *Non-expansive inspiration.*—In this form the chest-walls are elevated powerfully, yet the lungs do not expand. This occurs in pleurisy with effusion, in pneumothorax, in dense pleural adhesions, in phthisis, cancer, and in cases where the lung is impermeable to air.

4. A certain proportion between the movements of the chest and abdomen should exist, and any variations deserve notice. *Thoracic breathing* is the normal type of respiration in females. It occurs in males in diseases which interfere with the action of the diaphragm, in paralysis of the diaphragm, in abdominal tumour, in ascites, and in peritonitis.

5. *Abdominal breathing.*—This kind of respiration is normal in males, and is an infantile type of respiration carried to the extreme. In this, the respiration is carried on chiefly by the diaphragm. In disease this occurs in spinal paralysis, in tetanus, in pleurodynia, pleurisy, and in phthisis.

Palpation is effected by placing the hand over the chest. It determines the movements of the chest, the vocal thrill, and various adventitious sensations, thus confirming the results of inspection and adding further information. Movements of the chest have been detailed in the results of inspection.

We further ascertain the existence of *vocal thrill* (fremitus). In health, it is a feeble movement produced when a person speaks, and can be felt by the hand applied to the surface of the chest. It is somewhat stronger over those parts of the lung where there is not much fat. Is more marked on the right than on the left side, owing to the right lung being more developed than the left. The difference is also supposed to be due to the anatomical arrangements of the trachea and the bronchi on the right and on the left sides of the chest. The right bronchus is generally wider and shorter and at right angles to the trachea, the left being narrower, longer, and somewhat obliquely placed. The vocal fremitus can be best made out by causing the patient to say "Hah!" or counting one to twenty. During health, the vocal vibrations are transmitted from the trachea and the bronchi to the chest-walls, but their intensity is considerably diminished owing to the normal elasticity or tension of the air-vesicles.

Friction fremitus, when it exists, may be felt while the patient is taking a deep breath, and when the two rough surfaces of the pleuræ rub against one another.

Vocal thrill in disease.—It is diminished or altogether abolished in conditions which separate the lung from the chest-walls. Thus, in pleuritic effusion and in cancer the thrill is abolished. It is increased in cases of consolidation of the lungs by pneumonic engorgement or exudation, or by tubercles, &c.

Adventitious sensations.—(1) *Fluctuation.*—It is felt when the intercostal spaces are widened and tense, and when there is fluid in the chest.

(2) Adventitious sensations are sometimes felt on applying the hands to the chest during respiration. These are bronchial and cavernous fremitus. The former is caused by the movement of fluid secretion in the bronchi; the latter, by movements of fluid secretions within pulmonary cavities.

Percussion.—It may be immediate (or direct) or mediate (indirect). Immediate percussion is effected by striking the chest directly with the fingers. Mediate or indirect percussion is done by placing on the front of the chest one or two fingers or a pleximeter, and striking with one or two fingers of the other hand, or with the hammer. The most convenient plan is to place the fore and middle fingers of the left hand evenly and firmly on the chest, with the palmar aspect next the skin, and to strike their dorsal surface with the tips of the fingers of the right hand. The stroke should be perpendicular to the surface, quick, sharp, and from the wrist, the elbow remaining stationary.

Percussion sounds possess a certain loudness, pitch, and duration. The sound that is produced by vibration of a stretched membrane is called a note; and as a string requires a bow to produce it, so does a membrane require to be struck. The elasticity of the healthy lung is similar to that of a highly-inflated bladder, and hence the sound is never hollow. The sounds so produced have reference to the presence or absence of air in the part percussed. The result of the percussion of a healthy chest is that it is resonant everywhere except over the heart, the liver, and the spleen. The sound thus produced is called a normal resonant sound, and is of a vesicular quality. Percussion may be superficial or deep, may vary from the gentlest tap to the hardest heavy stroke, by which means we can detect a change of note due to substances considerably removed from the surface. Thus, a superficial percussion gives resonance over the hepatic region, due to the thin layer of superimposed lung, for an inch or two below the right nipple, while a deep percussion produces a dull note, due to the subjacent liver.

Resonance may be produced by air in a sac or a vesicle, or in a cavity of a considerable size, or in several small cavities subdivided, as in the lungs. The sac or cavity may be completely closed or may be partially open. When closed, it is necessary, in order to produce resonance, that the walls of the cavity should generate the sound and also be capable of transmitting it. In order to generate a sound the internal surface of the cavity ahould be moderately tense, as is best exemplified in the tympanum of the ear.

When the sac is partially open a resonance is also produced, and the pitch of the sound depends upon the size of the opening. By percussing on the cheeks while quite relaxed, and the mouth being shut, no resonance is heard; but percuss it again when the mouth is open and a subtympanitic resonance results. Again, open the mouth to its full width and the pitch will be still higher.

Percussion offers for observation (1) the extent and character of the resonant sound, whether clear, or dull, or tympanitic, or tubular, or cracked, or amphoric; (2) the duration of the resonance; and (3) the degree of resistance or the elasticity of the part percussed.

Extent and character of the resonant sound during health.—It extends from the apex of the thorax on each side as low as the sixth rib in front, the seventh at the sides, and the tenth or eleventh behind. The viscera encroaching upon these limits are—the heart, which causes some amount of dulness in front and left side of the chest; the liver, which can be detected on the right side, and on deep percussion as high as the fifth rib or the fourth intercostal space in front, and ninth or tenth rib behind; the stomach has its own resonance, which varies in extent, but may exist normally as high as the fifth rib.

Resonant sounds of the chest in disease.—The force used during percussion being equal, if the lung resonant sound elicited on both sides be not the same, we may presume the existence of disease, but it is to be remembered that the greater the rigidity and fatness of the chest-walls the less distinct will be the resonance produced. Pulmonary resonance is a sound produced by percussion over the healthy lungs, and its pitch can be ascertained only by experience. It is a sound midway between tympanitic or full, and hollow or tracheal, resonant sounds. In a scale of resonance the pitch is progressively raised and the duration progressively diminished, as we ascend from the tympanitic to the tracheal sounds.

Character of the resonant sounds.—During health the resonance produced by percussion is called a typical resonance, and when one side of the lung is diseased the typical resonance may be manifested by the other sound side; but when both sides are diseased, as often happens, then only one portion is more defectively resonant than the other, and the comparison is still useful. When produced on percussing the stomach the percussion sound is full. Tubular resonance, or that produced by percussion over the trachea, is high pitched and of a shorter duration. When the upper lobe of the left lung is solidified, tracheal resonance is observed on striking the front of the chest.

Metallic sounds.—These are sounds of a peculiar resonance. They are two in number: 1. Amphoric or metallic. In it the metallic resonance is superadded to the tympanitic resonance. It has in addition a musical tone, resembling that produced by blowing over the open mouth of a bottle. It occurs in pneumothorax and in phthisis with large superficial and empty cavities. 2. Cracked-pot sound. It is also a tympanitic resonance with a hissing or rattling sound superadded. It is produced by the escape of air through a chink or a hole. It is best imitated by clasping the hands loosely together and striking the back of one of them upon the knee. In order to produce this percussion sound, a partially closed cavity, communicating with the external air, is required; this is situated between two solid opposing media, which, when percussed, press upon the cavity and cause the escape of air. Thus, cracked-pot sound is produced in phthisis, where there is a small superficial cavity, more especially in the clavicular region, communicating with one or more bronchi. It is heard most clearly when the patient keeps his mouth open.

Intensity of resonant sounds.—The sound produced by percussion may be either an increased or a diminished resonance.

Increased resonance.—When the resonance is increased the sounds become tympanitic, this character is due to the want of vesicular quality. Tympanitic resonance is a hollow sound, and of a higher pitch, and is produced by air in a space or spaces of some size; it is best heard in pneumothorax and in emphysema, or where the column of air in the enclosed space is extremely great, as over the stomach and intestine; in engorgement of the lung, where the air is confined in a large space of the bronchi, as occurs in pneumonia affecting the upper lobe and in phthisis.

Diminished resonance.—This varies from slight diminution of resonance or dulness to complete absence or flatness. In it the note is short, high pitched, and more muffled. Resonance becomes deadened and more and more impaired, or less and less clear, as the thickness of the material upon which percussion is performed is increased, and the resonance is then said to be obscure, dull, or toneless. Complete dulness in any part indicates an increase of the solids or fluids within the chest, or a diminution of air within the air-vesicles without any increase of the solids or fluids. With the deadening of the percussion sound there is always an increased resistance felt over the point struck. In parts which are completely dull the resistance is greatest. The increase of solids occurs in solidification of the lungs, as in pneumonia during hepatization, cancer, and phthisis. Dulness due to liquids occurs in œdema, pleural effusion, and hydrothorax. It occurs in lungs in which the air has been diminished by disease, as in pulmonary collapse.

Flat sound.—It denotes absence of resonance. The sound produced on percussing over a mass of bone or muscle is of this character. In disease it is produced in cases of pleural effusions, of solidified lungs, and of tumours or enlarged glands pressing upon the lung; of liquids mixed with lung tissue, as in œdema of the lung; in pneumonia in the second stage, and in tuberculosis and cancer of the lungs. The pulmonary sound or resonance may become muffled if there be air contained in a single large closed cavity, the walls of which are rough and vibrate very imperfectly, or in numerous small cavities with tense vibrating walls. Thus, liquid or solid exudations into the lungs, exudations, effusions, or old adhesions of the pleura, extreme distension of the lung, as in emphysema, all tend to diminish resonant sound.

The degree of resistance or elasticity.—The resistance produced on percussion varies in proportion to the compressibility of the part percussed; the solids and liquids are highly resistant, whereas those tissues which contain air are much less so. It is thus that solids are distinguished from liquids and from air-containing cavities. Thus, resistance is increased in consolidation of the lung, in large pleuritic effusions, and in distension of the pleura with air. In these cases the elasticity of the parts is also diminished. Diminution of resistance rarely occurs, though it is sometimes observed in severe pulmonary emphysema and pneumothorax.

Auscultation, like percussion, may be direct (immediate) or indirect (mediate). It is direct when the ear is applied to the chest, and indirect when the stethoscope intervenes. The commonest form of stethoscope is a wooden tube with one end slightly expanded, while a circular earpiece is fitted to the other. A stethoscope for both ears, with a continuous elastic tube, and many other varieties are used. Care must be taken that the chest end of the instrument is applied in its whole circumference and without any heavy pressure. In the healthy chest breathing sounds and voice sounds are audible on applying the ear or a stethoscope.

The auscultation of the surface of the chest is practised with the view of distinguishing three kinds of sounds:—1. The respiratory or the breathing sounds. 2. The voice as heard over the thorax. 3. The adventitious sounds produced in the pleura or the lungs. Auscultation detects (1) healthy sounds or breath sounds, (2) unnatural sounds, such as râles, friction sounds, and various metallic sounds; also vocal sounds (vocal resonance), which are produced during the act of speaking and of coughing, and succussion sounds.

Physical conditions of the respiratory sounds.

The respiratory sounds are two in number, and are known as inspiration and expiration sounds. These are produced by (1) the transit or entrance of air in inspiration through the glottis into the trachea and bronchi, and thence into the alveoli and vesicles. (2) The passage or exit of air in expiration through the narrow mouths of the air-vesicles and minute bronchi into the wide passages beyond. (3) When from disease the small bronchi and air-cells are obliterated or occluded, and a large bronchus or cavity with unbroken walls only remains as the part producing sound; the air passing through the mouth of such a tube makes a clear definite sound, called bronchial or cavernous respiration.

Respiratory sounds in health.—They are heard over any part of the healthy lung, and are most distinct where the chest-walls are thinnest, and are known as respiratory murmur or breath sounds, the sound produced in the air-cells or spongy structure of the lungs being called *vesicular breathing.* That heard over the large air tubes between the scapulæ, and in front over the bifurcation of the trachea, is called *bronchial breathing.* The respiratory sound or vesicular breathing in children is loud, and is known as *puerile* respiration. This is due to the frequency and depth of their respirations, to the thinness of their chest-walls, and to the perfection of the membranous septa of their lungs.

Vesicular breathing.—This sound is heard where the healthy lung is in contact with the chest-wall. It is louder and of longer duration as the respiration becomes deeper. In health the inspiratory sound is equal in duration to the inspiratory movements; the expiratory sound follows without any interval, and is much shorter in duration and less loud than the inspiratory sound. The expiratory sound is always equal in duration to expiratory movements, and whatever lengthens and deepens the expiratory movement makes the vesicular sound longer and louder. In fat persons and in adults generally, when the breathing is quiet, the expiratory sound is almost, if not quite, inaudible.

Bronchial or tubular breathing is heard during health about the upper dorsal vertebræ. It is a special quality of sound, and may be imitated by blowing gently through a tube. Another kind of bronchial breathing is known as cavernous breathing, and this may also be simulated by blowing through a cup-shaped cavity with a chink at the opposite end. In bronchial breathing the expiration is always audible, although usually less loud than the inspiration.

Respiratory murmur in disease.—Disease may cause the respiratory sound to cease. It may be weak or loud, may be replaced by another, or may be associated with various additions. The respiratory sound is diminished or suppressed on both sides of the chest in obstruction within the larynx or trachea. It is much diminished on one or both sides in capillary bronchitis and in bronchial spasm (asthma). It is feeble or absent on one side in pleural effusion, cancerous growths, and in mechanical obstruction completely filling a large bronchus. Weak respiration on both sides of the chest implies a less than usual quantity of air entering the lungs; it may be due to an obstruction in the air-passages, to the paralysis of the diaphragm, or may be caused by paralysis of the costal muscles, or whatever interferes with the movements of the chest-walls. Loud respiration heard on one side indicates compensatory action of that side in cases where the other side is diseased. It implies that obstruction is not in the trachea, but in some part of the lungs beyond. This is common in cases of tubercles in the air-cells. Short inspiration with prolonged expiration is common in emphysema.

The breathing sounds may be replaced—bronchial or amphoric breathing being substituted for the normal respiratory murmur. These sounds shade into one another, and for the purposes of explanation may be taken to be identical.

The explanation of the bronchial breathing is as follows:—The air entering a bronchus produces a sound such as may be made by blowing down a rigid tube. This clear sound is inaudible in a healthy lung, owing to the intervention of a bad conducting medium, viz. air and vesicular walls. When the lung is solidified, the spongy lung or the air-cells are obliterated, either from collapse or from the exudation within them. When this obstruction or the exudation is removed the clear breath sound is reheard. During bronchial breathing the stethoscope is in direct relation with the walls of the bronchus. This sound is tubular in character and high-pitched. In it the inspiration is short, and the expiration prolonged, louder, and higher in pitch than the inspiratory sound. This occurs in the second stage of pneumonia, in phthisis, in consolidation of the lungs from any cause, as by liquid, or tumour, or in simple congestion and œdema. In cases of thickening of the bronchial tubes with condensed surrounding structure, as occurs during the collapse of the lung, bronchial breathing is heard.

Amphoric or cavernous breathing.—Destruction of the air-vesicles and formation of large cavities, as in phthisis, and the dilatation of the bronchi from any cause, give rise to cavernous breathing. Cavernous respiration is usually a sign of cavity. In it the inspiration is low in pitch and has a simple blowing quality, the expiratory sound is still lower. There is also increased vocal resonance. The speech is sometimes transmitted through the stethoscope constituting a vocal sign called pectoriloquy. With cavernous respiration there are associated amphoric resonance and cracked-pot sound on percussion.

Additions to the respiratory sound.—These are included under the terms *rhonchus*, *râle*, or *rattle*, &c., and adjectives are joined for the purpose of describing the acoustic qualities of the sounds. They are produced in different situations, namely, in the *air-passages*, the *vesicles of the lungs*, *pulmonary cavities*, and on the *pleural surfaces.*

Air passages.—In the trachea and bronchial tubes râles are heard, owing to the passage of air through thin liquids, or to the bubbling of thin mucus, pus, or blood, or serum. Occurring in the bronchial tubes they are called moist or mucous râles. The air in its passage forms bubbles, which, when produced in the large-sized bronchi, are termed coarse, crepitant, or gurgling, and in the small-sized bronchi the fine or crepitant râles. When produced by the presence of a liquid in extremely fine bronchial tubes they are termed subcrepitant râles. All these moist râles are heard in bronchitis affecting the larger tubes, in capillary bronchitis, in pneumonia, and phthisis. They are high-pitched if the surrounding lung be consolidated, and of low pitch if there be no solidification. Other râles are known as dry bronchial râles, and are due to the passage of air through the dry and inflamed tube, or through tubes contracted by the presence of viscid mucus, or by swelling of the membrane, or by spasm of the bronchial muscular fibres. They may be sonorous or groaning, or sibilant or hissing, the low-pitched sound being called sonorous, the high-pitched sibilant. Both are present in both sides and very abundant in asthma. They also occur in bronchitis when secondary to phthisis, and likewise in primary bronchitis. In the air-vesicles the râle heard is called crepitant râle. It resembles the sound produced by rubbing a lock of hair between the fingers close to the ear. It is a dry sound heard during inspiration, and generallly at the end of the inspiratory act. It is pathognomonic of pneumonia in the first stage. Cavernous râle or gurgling râle is due to agitation of a liquid within a cavity by the entrance of air during inspiration.

There are other sounds in addition to breath sounds, namely, bronchophony, pectoriloquy, and œgophony. These are voice sounds. Other abnormal auscultation sounds in the chest are amphoric breathing sounds. These are of three kinds, and are produced by the passage of air into and out of a large cavity, with smooth, regular, concave walls, and surrounded by consolidated lung.

1. *Amphoric breathing or echo* is a metallic resonance, and resembles the sound produced by blowing or speaking into a large empty glass bottle. This sound indicates the existence of a large cavity containing air. It may accompany the healthy respiratory sounds, the vocal resonance, or râles. It may be heard while the patient is swallowing liquid, or after coughing.

2. *Metallic tinkling or rattling.*—It resembles a sound heard on striking a metallic vessel with a pin, and is a single sound. It is heard in pneumothorax and over large excavations in the lungs. It seldom or never attends the respiratory sound, but mostly alternates with it; it is constant during speaking and coughing; it is limited to one side of the chest, and is best heard at the apex, where also it is of a limited extent.

3. *Metallic or percussion sound.*—It is a clear ringing sound, and is produced in large cavities filled with air and surrounded by smooth walls, which regularly reflect the sound, the cavity being completely enclosed or having only a small opening. It is heard on listening over the surface of a large air-containing cavity while the assistant strikes the surface of the chest with the hammer, or uses the hammer and a pleximeter. It is also heard in pneumothorax.

Other additions to the respiratory sounds are produced outside the lungs, and these are known as pleural sounds. These are the *friction sounds,* and sounds produced in the pleural cavities. Friction sound is in character a rubbing sound, which accompanies respiratory movements. It varies from the slightest grazing to the harshest scraping. With regard to its position, it is most frequently heard over a small part of one side of the chest, below the axilla, or about the angle of the scapula. With regard to time, it may accompany expiration or inspiration, or both, or may be heard only at the end of inspiration. It is unaccompanied by any unnatural respiratory or vocal sounds. Cough has no power in removing or modifying it. The sounds are due to roughness of the pleura caused by lymph-exudation, or to the presence of miliary tubercles. They occur in the first and in the third stage of primary pleurisy.

Sounds produced in the pleural cavity.—These are *succussion or metallic splashing and ringing sounds.* The succussion sounds are due to liquid and air contained in the pleural sac. They are heard even without putting the ear to the chest, when the patient is shaken, or when he suddenly changes his position, and by the patient himself as well as by the physician. These sounds are produced in a large cavity with smooth walls, and are best heard in hydropneumothorax, and hydropneumopericardium. Sometimes a distended colon gives rise to a succussion sound.

Vocal sounds.—Auscultation of the voice often assists in the diagnosis of diseases of the organs of respiration. A sound is heard on applying the ear to the surface of the chest when the patient is made to speak. The vibrations of the vocal cords are conducted along the column of air in the large bronchi, and are perceptible to the ear. When the respiratory apparatus is in a normal condition, the words spoken by the patient are heard as an indistinct buzzing or humming; they are indistinguishable from each other. Over the larynx and opposite the bifurcation of the trachea the words are heard distinctly. This clear sound resembles bronchophony. It differs in a marked manner from the humming vocal resonance. During health the clear vocal resonance is best heard behind in the upper part of the interscapular region, where it approaches more nearly in character to the sounds of the voice heard over the larynx. The sound of the voice produced in the larynx passes upwards, and also downwards from the vocal cords to the trachea. The progressive diminution of the size of the air tubes as they become subdivided, and the rigidity of their walls, lessen the force of these sounds, and hence the resonance of voice heard over the surface of the chest is both weak and muffled. Further, the pulmonary air-vesicles are bad conductors of sound, and hence in them the vocal resonance is muffled. The vocal resonance may be diminished or increased in intensity. It is diminished or suppressed by copious pleuritic exudation and by pneumothorax, and it is slightly diminished when the bronchi are loaded with secretion from the mucous membrane, as in chronic bronchial catarrh. In this latter case the profuse secretion prevents the waves of sound from freely entering the air-passages. In these instances the voice is rendered so feeble as to be almost, if not quite, inaudible. On the other hand, the voice may be intensified to such a degree that many of the words become clearly articulate. This increase is known as bronchophony, modifications of which are pectoriloquy and ægophony.

Bronchophony.—It is an increased vocal resonance, and due to conditions similar to those which produce bronchial breathing. All causes which aid or increase the conducting power of the lung-tissue tend to produce bronchophony. Thus, in cases of consolidation of the lung, and where there is an extensive excavation enclosed by solid walls, bronchophony is invariably present. Bronchophony is also heard when the lung is compressed by pleuritic exudation, but only at those parts at which the dense lung is in immediate contact with the wall of the chest, that is, posteriorly, between the vertebral column and the scapula. *Pectoriloquy* was a term used by Laennec to describe the loud and exaggerated quality of voice heard over very large and superficial pulmonary cavities. But the sound in question differs in no essential respect from bronchophony; it simply possesses a higher degree of intensity. Bronchophony is generally loudest over cavities, but sometimes it is weaker there than over tissue, simply infiltrated, but not excavated. Laennec's pectoriloquy is a loud bronchophony.

A variety of bronchophony is known as ægophony, and resembles in timbre the bleating of a goat or the nasal twang of the voice when the nostrils are closed. Ægophony is met with in cases of moderate pleuritic exudation, and is heard towards the upper margin of the fluid, at the back of the chest, and in the interscapular region, near the lower angle of the scapula. It indicates the presence of a thin layer of fluid in the pleura or a superficial collapse of the lungs. Its peculiarities are due to the fact that instead of a uniform transmission of sound in pleuritic effusion, the deeper vibrations of the tones of the voice are arrested in their transit, and the finer undulations reach the ear of the hearer. According to Skoda ægophony is also heard in some cases of pneumonia, in caseous pneumonic infiltration of the substance of the lung, and sometimes even between the shoulder-blades of children in health.

A tabular statement of the principal respiratory sounds in disease is appended to this section. It will be found of use for the easy comprehension of the subject and for reference. An example of a condition in which each sound is heard is also given.

There are three kinds of sounds heard in connection with the lungs. These are (1) respiratory sounds or breath sounds; (2) adventitious sounds, or additions to the breath sounds, produced in the lungs or the pleuræ; (3) voice sounds.

1. *Respiratory sounds, changes in.*—(*a*) Breathing sounds simply absent, as over a large effusion, cancerous growths, &c.

(*b*) Breathing sounds simply increased (puerile breathing), as in the unaffected lung in unilateral pneumonia.

(*c*) Bronchial breathing, in pneumonia, second stage.

(*d*) Cavernous breathing over large cavity in phthisis.

2. *Adventitious sounds or additions to breath sounds.*—(*a*) In the interior of the lungs, *i. e.* in air-cells, and large and small air-tubes.

(*a*) Crepitant râle, in pneumonia, first stage.

(*b*) Subcrepitant râle, in tuberculous lung, second stage of softening of tubercles.

(*c*) Large moist râle
(*d*) Rhonchus (dry) } all heard in various stages of bronchitis.
(*e*) Sibilus (dry)

(*β*) External to the lung.

(*a*) Friction sound, in pleurisy without effusion.

3. *Voice sounds.*—(*a*) Bronchophony, wherever there is bronchial breathing.

(*b*) Pectoriloquy, a modification of bronchophony, and heard over large and superficial cavities in phthisis.

(*c*) Ægophony, in pleurisy with moderate effusion.

I have gone thus fully into the subject of the physical examination of the chest, because it is only by an accurate method of observation, and the precise use of terms that certainty can be attained in the diagnosis and description of the diseases of the lungs. The best plan for the physician or the student is to keep in mind a definite formula for the physical examination of the chest, and to let the steps of the examination follow each other in the same order. The time which he may sometimes appear to waste by rigidly adhering to this system will be more than made up for by the superior accuracy which he will attain.

The following formula may be used:

Inspection . .	Shape of chest. Condition of muscles. Movements.
Palpation . .	Confirm inspection. Vocal vibration and fremitus. Observations of rarer phenomena, as fluctuation.
Percussion . .	Determine areas of dulness. Determine areas of resonance. Resistance.
Auscultation .	Breathing sounds. Adventitious sounds. Voice sounds.

Physical Examination of the Heart.

The examination is effected by means of inspection, palpation, percussion, and auscultation.

Inspection.—(1) *Outline of the chest.*—In a healthy chest there is no break in the outline over the heart. In children suffering from rickets there is a deformity seen over the cardiac region, which is not due to any heart disease. In excentric hypertrophy, when considerable, there is a distinct bulging.

2. *Impulse.*—It is a natural movement of the apex as seen or

felt. In the normal state during the ventricular systole we see and feel the impulse at a spot on the chest corresponding to the apex-beat, and uncovered by the lung. This spot receives a shock, and the limited space about three-quarters of an inch round the apex bulges slightly forwards. The impulse is due to the force with which the heart descends and is pressed against the chest-wall during ventricular systole. The descent of the heart during systole is supposed to be due to elongation and stretching of the great vessels, and to the recoil of its fibres when the blood is expelled from it during contraction. The pressure of its apex against the chest-wall can be easily explained. The heart lies upon the diaphragm, the surface of which slopes forwards. During systole the pressure suddenly becomes less over the heart's outlets than at the apex; the latter, therefore, moves downwards and forwards, and against the intercostal space, which consequently bulges.

Alteration in character and position of impulse.—During health.— In children, it is usually seen in the fourth intercostal space, and in the line of the left nipple. In adults, it is visible between the fifth and sixth ribs, an inch and a half below the left nipple and an inch to its sternal side. In either case, if the heart be excited from any slight cause, a greater or less increase of shock will be noticed.

In disease.—In emphysema, upon inspection and palpation we can detect a well-marked impulse in the epigastrium, synchronous with the pulse. This is due to depression of the diaphragm, a frequent result of emphysema. In tumours in the chest and in pleurisy with effusion the impulse is displaced to one side or to the other. In excentric hypertrophy the apex is displaced to the left. In cases of ascites, ovarian dropsy, or any other abdominal tumours, the apex is pushed upwards. Various deviations from the normal cardiac impulse are met with. The impulse is intense or heaving in hypertrophy. It may be forcible in a normal heart excited by any trifling cause. In the former or heaving impulse a strong shock or sensation is communicated to the head of the listener, and the chest-wall as well as the head is pushed forwards by the shock. In the other the chest is not shaken, and a shock is perceived only by the head. The impulse thus excited is known as palpitation. Heaving impulse is always pathognomonic of hypertrophied heart. Palpitation is common in anæmia, in general nervousness, as in the the hysterical, and in those addicted to drinking. In them the impulse is stronger and more extended. It is also strong in many cases of dyspepsia, in those who smoke too much, and in females with uterine disease. The impulse is *feeble* in a feeble relaxed heart; in fatty heart the impulse is often imperceptible. It is either imperceptible or extremely weak, and is also felt too low down in pericardial effusion. This is owing to the fluid intervening between the apex and chest-walls. The impulse disappears altogether when the patient lies down. In emphysema, even though the heart may become considerably enlarged, the shock is often imperceptible, owing to the lung having interposed between the organ and the chest-wall.

Epigastric pulsation.—This occurs when the heart is excited or hypertrophied. It is a shock observed in the epigastrium and is produced by the depression of the left lobe of the liver during ventricular systole. This is best noticed in mitral disease.

In disease, besides impulse we have another movement of the heart or an abnormal sensation felt on palpation, and which is known as *thrill* or *fremitus*. It is a quivering sensation felt by the hand applied over the præcordial region. Thrill may be either systolic, presystolic or diastolic; these all originate within the heart or at the root of the great vessels. Another form of thrill is exocardial, *i. e.* pericardial, being generated in the pericardium. Thrill is most often caused by the obstruction to the passage of blood through diseased valves. In aortic obstruction we feel a distinct wheezing about the aorta during systole. It is felt at the base of the heart and to the right of the sternum. In aortic regurgitation it is rare. In mitral stenosis it is felt at the apex, and immediately precedes the beat of the heart, and ceases suddenly as the beat commences. When this occurs it is known as præsystolic thrill. In aortic stenosis it is very characteristic, and may be perceived through thick clothing. Friction fremitus is a distinct sensation perceived when the hand is laid upon the chest. This is felt in a few cases of pericarditis.

Percussion.—By it we determine the area or boundary of dulness of the heart, its position and direction. *The extent of dulness* varies with the force used in percussing. Gentle percussion detects an area of superficial dulness in parts where the heart is uncovered by the lung. The *superficial area* of dulness (normal) over the heart is triangular in shape, the right border being the mid-sternal line, extending from a point on a level with the fourth cartilage downward, where it is blended with the upper limit of the dulness of the liver, the base being a line drawn from immediately below the apex-beat to the upper limit of the liver dulness. The left border is an imaginary line between the apex-beat and the left sternal edge of the fourth rib. The dulness exists for a circle two inches in diameter, taking as a centre the middle of the left fifth costal cartilage. Hard percussion brings out an area of about one inch greater in every direction, and it may be difficult or impossible to make it out, owing to continuity of cardiac dulness with a pleural effusion or a solidified lung. In hypertrophy and in dilatation the *area* is *increased*. It is extended in width in valvular diseases. In pericarditis, at first the percussion note reveals dulness at the root of the aorta and pulmonary vessels. During copious effusion the dulness is triangular, with the base downwards and apex above. It is broader as it extends lower. The dulness is diminished or masked altogether in emphysema, pneumothorax, and dilated stomach.

Auscultation.—By it we determine the characters of the heart-sounds and of murmurs over different parts of the organ. Normal sounds of the heart are known as systolic and diastolic, or the first and second sound. The *systolic* or the first sound is the longer and duller, and coincides, or is synchronous with the impulse. The *diastolic* or the second sound is shorter and sharper, following the impulse and corresponding with the beginning of the heart's diastole. The first sound is best heard between the fourth and fifth left intercostal spaces and just internal to the left nipple, the second sound at the base of the heart, and at the junction of the right third costal cartilage with the sternum. Very often the sounds are more or less doubled or repeated; they are then called *reduplicate*. These are probably produced by the non-synchronous tension of segments of the valves. The first sound of the heart is produced in the ventricles and arises from the tension of the auriculo-ventricular valves, due to the force with which the volume of blood is thrown against them during the cardiac systole. Some physiologists are of opinion that the sound is caused not only by the tension of the valves, but also, at least in part, by the contraction of the muscular fibres of the ventricles, and others have supposed that the rush of blood through the narrowed orifices of the aorta and pulmonary artery, and the friction of the particles of the blood amongst each other, and against the ventricular walls, have a share in its production. It would appear, however, that the sound is due in great part to valvular tension, and in a smaller degree to the muscular contraction. The duration of the sound is equal to the ventricular systole. The second sound is heard during the diastole or when the ventricles cease to contract and the aortic and pulmonary valves close. It is separated from the first by a short *pause*, and is produced in the arteries alone. This sound is due to the tension of the semilunar valves of the aorta and pulmonary artery, when the blood projected into the vessels is forced backward by the elastic energy of the walls of the arteries. There is now scarcely any difference of opinion with regard to the cause of this sound. Besides the natural sounds above alluded to, we find in disease various alterations and additions. Both sounds are intensified, or distinct and loud, when the action of the heart is increased and prolonged as in hypertrophy. This change, as regards the first sound, is owing to the fact that the mitral and tricuspid valves are exposed to the full force of the blood and are thus thrown into violent vibrations. The second sound is intensified because the aorta and the pulmonary artery receive a large quantity of blood, and recoil with greater force, and the tension of the semilunar valves is heightened in consequence of the increase of the arterial contents. The sounds are very *feeble*, although pure, in simple dilatation. This is accounted for by the feeble action of the heart, and the languid state of vibration of the valves and arterial walls. The sounds are remarkably feeble, or even inaudible, in a weak or flabby heart. They are also feeble in pericarditis with effusion and in emphysema. In very fat persons feebleness of the sounds is commonly observed. Other sounds are known as *reduplicate sounds*. These are heard in fat persons, in patients with pericardial effusion and in emphysema. In functional disorders of the heart they are also heard. There may be three or four sounds occurring between two beats of the heart, or between two pulsations of the carotid artery. They are called reduplicate because they are doubled or repeated. They are generally intermittent sounds, and are due to non-synchronous action of the ventricles. They have a close relation to respiration. The reduplication of the first sound is rare. It occurs at the end of an expiratory or at the beginning of an inspiratory act. This is owing to the increased stimulus to the right ventricle. The reduplication of the second sound is more common, and occurs at the beginning of an expiration and at the end of an inspiration. In the latter case it is owing to the early cessation of the right ventricular systole. The reduplication of the first sound is real, and may be due to want of closure, simultaneously and during systole, of the homologous valves, namely the tricuspid and the mitral of the right and left side respectively. The want of closure at precisely the same time and during systole may be due to some difference in the amount of pressure exerted upon the valves, this difference of pressure depending upon the different states of respiration. Reduplications are sometimes apparent, and may be due to the auricular systole immediately preceding the ventricular systole. The reduplication of the second sound is observed in mitral constriction. It is most probably due to the tension of the mitral valves in early systole. The moment the ventricle becomes relaxed after its systole, the blood retained in a state of tension in the auricle enters with force into the ventricle, causes the valve to bulge towards the auricular cavity and in so doing occasions a sound immediately after the second sound. In some cases reduplication is real, and is due to nonsimultaneous closure of the semilunar valves of the aorta and pulmonary artery.

Intermittent sounds.—In some cases there is periodical intermission of the ventricular systole instead of one or sometimes two regular beats. In some it is a normal peculiarity. The patient is cognizant of it, by intermission of the pulse. In middle or old age, the intermittent sounds are common. More rarely intermissions at the wrists exist without corresponding intermissions of the heart's action. In such cases the carotids also pulsate regularly. The intermission in the pulse only shows that some of the ventricular contractions are not sufficiently strong to give rise to a corresponding pulsation of the radial artery.

Adventitious sounds.—Besides these natural sounds heard in conditions of health, and their abnormal modifications in disease, there are certain additions or alterations, known as adventitious sounds, or murmurs, or bruits. These murmurs either replace the normal sounds or are superadded to them as an addition. They are produced generally in two places. When outside the heart as in the pericardium, they are known as friction sounds or *exocardial* murmurs. They are caused by the rubbing together of pericardial surfaces. The other form of murmur is produced within the heart, and is called *endocardial*, and is caused either by changes in one or more of the valves, or by want of uniformity in the tension of valves and arterial walls. In the former cases, owing to alterations in their nutrition, the valves may become incompetent to fulfil their office, or they may cause the orifice, with which they are connected, to become contracted. Obstruction to the circulation is the result of both these conditions. But a murmur may be produced when there is no impediment to the passage of the blood, the sound being due to the presence of deposit on the valves, but not in such form or quantity as to impair their competency.

The *exocardial* murmur may be pleural, pericardial, or pleuro-pericardial. The *endocardial* murmurs are chiefly seated in the left side of the heart, but they may be produced at any one of the four orifices of the heart, and vary with the contraction and dilatation of the heart. These are called mitral incompetent or regurgitant, and mitral direct or obstructive, the aortic regurgitant and the aortic direct murmurs, and are named according to the blood-currents, and after the valves at which they are produced. Those on the right side of the heart are named tricuspid direct, and tricuspid regurgitant, the pulmonary direct and the pulmonary regurgitant. A murmur is sometimes produced within the left ventricle, chiefly in endocarditis, with the ventricular systole, but without any lesion permitting mitral regurgitation. This murmur is known as mitral systolic intra-ventricular murmur. During health and in a natural condition each orifice when open, freely admits the blood and when the orifice is closed it shuts the blood off completely. Not so in diseased conditions, in which during the systole any one of the four orifices may remain partially open, but obstructs the onward free passage of blood, or in which the orifice being only partially closed allows the blood to flow backwards or regurgitate. Thus, a murmur heard at the base, produced while the blood flows onwards from the ventricle into the artery, and during the systole is known as *obstructive* murmur. If, however, the murmur be produced while the blood flows backwards from the artery into the ventricle, and during the diastole it is called the *regurgitant* murmur. On the other hand, a systolic murmur, heard at the apex, indicates mitral regurgitation; a diastolic murmur, audible at the same spot, constriction or obstruction. These murmurs are due to some disproportion in the relationship between the force of the circulation of the blood and the cardiac orifices. They are the result of molecular vibrations in the blood, which are rendered intense, or otherwise modified, by disease of the valves. The endocardial murmurs are not variable; *i. e.* not apt to change from day to day, or from hour to hour. All endocardial murmurs are either systolic, diastolic or presystolic. The systolic and the diastolic murmurs replace more or less completely or immediately follow the first and second sounds respectively, and may extend more or less into the first and second silences. The presystolic does not replace either sound, but occurs only during the long pause towards its end, or after the second sound and before the ventricular systole or the first sound. Three observations must be made with regard to every murmur, in order to arrive at an accurate diagnosis. The points to be noticed are (1) Its time; (2) Place of best hearing; (3) Direction of its transmission.

Time or rhythm (*a*) of endocardial murmurs.—The endocardial murmurs correspond in frequency with the pulsation of the heart, or are synchronous with the heart sounds. The time is divided into four periods: 1, that of the *auricular systole,* a period which immediately precedes the impulse; 2, *ventricular systole* when the murmur accompanies the impulse or is synchronous with the first sound; 3, *auricular diastole* when the murmur follows the impulse or accompanies the second sound; 4, *the period of rest,* when the whole heart is at rest.

Place of best hearing.—Endocardial murmurs vary in intensity, quality, and pitch, and are, with certain exceptions, best heard at valvular orifices.

Intensity.—They may be very faint and soft, so that they are recognised with difficulty only after careful examination. They are often so masked by the breath sounds, that it is necessary to cause the patient to refrain from breathing. On the other hand, they may be so loud as to be heard all over the chest, and even at a short distance from the surface. Such intense murmurs are always systolic.

Quality.—May be soft, or harsh and rough, or whistling and musical.

Pitch.—The murmur is generally prolonged and gradually subsides. The point of maximum intensity or best hearing is different for the different valves. Further details as to the place of best hearing will be of great value in diagnosticating the several forms of disorders of the heart. For this purpose an exact knowledge of the points in the thorax corresponding to the arterial and venous openings is necessary and useful.

The *aortic* sounds are heard at the right edge of the sternum at the level of the third costal cartilage. They are more audible on the left of the sternum, but owing to the pulmonary artery lying more directly upon the aorta on that side, it is very difficult to distinguish the aortic sounds in that situation. The *pulmonary* sounds are heard at the middle of the third costal cartilage on the left side; they are extremely rare. The *tricuspid* sounds are audible over the lower part of the sternum, they are also very rare. The *mitral* sound is less audible in the situation of the mitral valve, owing to its being in that situation overlapped by the right heart. It is also separated from the lateral wall by the lung. It can be best heard at the apex, which lies about the fifth intercostal space an inch and a half from the border of the sternum, and is in exact contact with the wall of the chest. The sounds and murmurs which originate in various orifices of the heart are often heard at other points besides those already enumerated. All these murmurs are frequently combined. We find cases where the systolic and the presystolic are combined, the aortic regurgitant with mitral obstruction, &c.

The direction in which the murmurs are propagated.—Murmurs are heard loudest at the apex and the base of the heart, and coincide with the systole, presystole, and diastole. Murmurs are loudest over places where they are developed, but the intervention of the heart and lung-structures sometimes causes them to be heard more clearly elsewhere. They are often carried by the blood-stream, and are hence louder in the course of the vessels in which the fluid is flowing than in the opposite direction. The systolic regurgitant murmur is often heard in cases of anæmia, but over the course of the pulmonary vessels. The mitral presystolic murmur heard in some cases of mitral contraction commences gradually, increases in intensity, and ends abruptly with the occurrence of the first sound. It is rough. The first sound which follows it is altered in character, has lost its normal dull tone and has become shorter and sharper, more like a second sound for which it is often mistaken. The second sound is accentuated and often reduplicated.

Inorganic, anæmic, or hæmic murmurs.—Besides those just enumerated, other murmurs, not due to valvular disease of the heart, are sometimes heard. Their cause is unknown, but they are probably due to irregularities and want of uniformity in the vibrations of the valves and arterial walls. They are invariably systolic and are generally accompanied by a more or less marked first sound. An inorganic murmur is soft, blowing, feeble, and of short duration; it is never harsh or rough. It is not permanent, but disappears gradually as the patient improves, and ceases altogether with the subsidence of the anæmia. It is heard most frequently over the pulmonary orifice, *i. e.* in the second left intercostal space, near the sternal insertion of the third rib. The murmur is also heard, but less frequently, over the mitral orifice, and in very rare cases over the aortic or tricuspid valves. In cases of chlorosis, it is very commonly associated with venous murmurs (*bruit de diable*) in the neck. These murmurs are sometimes heard in the course of acute diseases, as pneumonia, typhus, &c., but they are especially common in cases of anæmia, however induced. Their diagnosis is easily made as a general rule, the condition of the patient and the coexistence of venous murmurs in the neck indicating the true nature of the case. The diagnosis is confirmed by the improvement that takes place under appropriate treatment. Other murmurs in connection with the heart have their seat in the pericardium. There are, in addition, various murmurs sometimes heard in the arteries and veins.

Pericardial murmurs.—These are due to friction between the opposing surfaces of the pericardium, when the membrane is roughened by deposit of fibrinous exudation. The sounds resemble those of rubbing ("to and fro" sound) scratching or grating; they thus differ from the soft and blowing sounds heard in valvular disease. They are also generally accompanied by sensations of friction perceptible to the touch. They are not synchronous with either the systole or diastole of the heart, but occur irregularly with reference to these events, the heart sounds themselves remaining audible and unaltered, though masked by the more superficial friction sound. Pericardial murmurs are not propagated along the course of the vessels. Moreover they are heard only at the commencement and termination of the disease, for when the exudation becomes abundant the murmur disappears. They are, as a rule, first heard at the base of the heart; they diminish gradually in intensity, and disappear when either the deposit is absorbed or adhesions take place. Pericarditis is generally accompanied by pain and dyspnœa, symptoms which are less common in endocarditis. When much effusion has taken place the pericardial murmur ceases as above mentioned, and the increased dulness may be detected on percussion.

Arterial murmurs.—Certain sounds are heard in the large vessels near the heart. These are for the most part the sounds of the heart conducted by the aorta, but there are other sounds developed in the arteries themselves. In the carotid and subclavian arteries two sounds are heard, accompanying each contraction of the heart. The first of these consists chiefly of the transmitted first sound, but a portion of it is due to the stretching of the vessel. Over the abdominal aorta a systolic sound is heard, the second sound is inaudible. No sounds can be heard in the smaller arteries during health, but in diseased conditions, such as insufficiency of the aortic valves, all arteries, even those of small size, may yield a sound. When an artery is compressed, as with the edge of a stethoscope, so as to close it almost completely, a sound is heard. When the pressure is less a murmur takes the place of the sound. Arterial murmurs may also be due to local causes in the large arteries (carotid and subclavian), or may be transmitted to these vessels from the heart. Increased action of the heart often causes murmurs in the above-mentioned vessels.

With regard to aneurism of the aorta, there is generally a systolic murmur or sound. When the vibrations into which the wall of the aneurism is thrown are regular, a systolic sound is produced, when they are irregular a murmur is heard. If the aortic valves are at the same time insufficient, a diastolic murmur will also be heard, and even when these valves are normal a murmur of this character is generally heard above the aneurism. This is probably due to recoil of the blood or regurgitation from the sac of the aneurism into the aorta.

Venous murmurs are heard in the internal jugular vein, and very seldom in any other vein. They are sometimes heard in health, but they are a very frequent symptom in chlorosis and anæmia. The sound is more intense upon the right side than upon the left, and subsides when the patient lies down or makes a forced expiratory effort. The character of the murmur varies in different cases. It is sometimes soft, blowing or humming; sometimes it is loud and hissing, or roaring, occasionally it is of a musical character. The

French term for it is *bruit de diable.* It was formerly supposed to arise in the arteries. It is made more intense when the head is turned to the opposite side. Its cause appears to be the vibrations in the eddy formed by the jet of blood thrown into a space relatively large. The lower part of the internal jugular vein lies behind the sterno-clavicular articulation, and is attached on all sides, so that it cannot collapse like other veins, when the volume of the blood is reduced. The whirling movement of the blood causes a murmur. The *bruit de diable* can be heard in many healthy plethoric persons, by causing the head to be turned to one side. The vein is then compressed by the omohyoid muscle and the cervical fascia, and its calibre is reduced. Less blood, therefore, reaches the lower portion of the vein. Inspiratory efforts cause the murmur to become more intense; they favour the return of venous blood. When respiration is suspended, the flow through the jugular veins is checked and the murmur becomes less audible, or disappears altogether. It is also found to be modified by the pressure of the stethoscope. When firm pressure is made the circulation ceases, and no murmur can be heard. The stethoscope should, therefore, be applied very gently. When the murmur is loud and constant, and can be heard without turning the patient's head to the opposite side, it is, as a general rule, indicative of anæmia.

EXAMINATION OF THE ABDOMEN.

The abdomen is examined by means of inspection, palpation, percussion, and auscultation. By means of *inspection*, we recognise any evident change in the volume and shape of the abdominal cavity. The most common change noticed with regard to the size of the abdomen is enlargement. The normal dimensions of the abdomen vary considerably. In persons who eat much vegetable food, in those who habitually eat to excess, in those who take alcoholic drinks freely, and in those of sedentary habits the abdomen is apt to increase in size, owing to distension of the bowels, and the development of adipose tissue. When the increase is of a pathological character, other signs of disease generally coexist; these are, jaundice or pallor, and other changes in the colour of the skin, and emaciation of the rest of the body.

Enlargement of the abdomen may be either partial or general. Partial enlargements are most frequently due to increase in size of some one or other of the abdominal organs. Enlargement on the right side is usually due to some affection of the liver, such as cancer or hydatid cyst. Partial enlargement on the left side is generally due to hypertrophy of the spleen. Dilatation of the stomach causes a more or less oval-shaped swelling in the epigastrium. Fæcal accumulation in any part of the colon causes that portion of the intestine to become prominent. Such accumulations most commonly take place in the cæcum, and in the descending colon. The tumour in these instances is found in the right or the left groin. Tumours of the uterus are found in the middle of the lower part of the abdomen. Tumours of the ovaries are found on either side, but as they increase they may occupy a considerable portion of the lower part of the abdomen. Tumours connected with the kidneys occupy the lumbar region, and sometimes portions of the right or left hypochondrium. The bladder, when much distended, forms a tumour visible to the eye, at the lower part of the abdomen; the swelling is rounded or pyriform in shape, and extends above the pubes towards the epigastrium.

General enlargement of the abdomen is produced either by the presence of fluid in the peritoneum, or by distension of the intestines. When fluid is present in the peritoneum the swelling is smooth and uniform. The appearance of the abdomen, however, becomes altered when the patient changes his position. When he lies on one side the swelling becomes more prominent in the dependent portion, and less marked above; when he lies on his back the swelling is mainly at the sides; when he stands up the swelling tends to occupy the lower part of the abdomen. When, however, the effusion is abundant, these changes do not manifest themselves, but the integument appears tense, shining and pale, or whitish-blue in colour. The superficial veins are often much dilated; this appearance indicates congestion of the portal system. When the enlargement is due to distension by gas in the intestines, it is unaffected by change of posture. A large and tumid abdomen in a child is a symptom of tabes mesenterica. The same symptom is also met with in rickets, and tubercular peritonitis. The abdomen is diminished in size in wasting diseases, and when, owing to cancer of the stomach, stricture of the œsophagus, &c., food is prevented from reaching the alimentary canal. In some cases of lead colic the walls of the abdomen are much depressed, the recti muscles being strongly contracted.

The second method of examining the abdomen is that of *palpation.* In this process the palm of the hand, or one or more fingers are placed gently and without undue pressure, on the portion to be examined. Care should be taken that the temperature of the hand be as near that of the normal medium as possible. Palpation enables us to determine the size, form, consistence, and situation of various organs; it also detects tenderness and deficient sensibility, and likewise the presence of any abnormal body.

In examining the abdomen by palpation the patient should lie upon his back, and it is often advantageous that the thighs should be more or less flexed. The subcutaneous fat and the tension of the abdominal muscles are the main obstacles to palpation. In the normal condition the abdomen generally is felt to be soft, but the recti muscles almost invariably cause a feeling of hardness along the middle line. The edge of the liver can be felt during deep inspiration, and when the organ is enlarged, palpation may detect the presence of the tumour, and also whether it be painful or painless. By palpation we may also discover whether the surface of the tumour is smooth or nodulated, and whether the swelling is hard and firm, or soft and fluctuating.

The spleen in its normal condition does not admit of examination by palpation, but when enlarged it is felt below the margin of the left false ribs, especially if a long and deep inspiration be taken. Tumours of the spleen vary considerably in size. In intermittent fever, and in leucocythæmia the splenic tumour often attains enormous dimensions. It is very common in India to see natives with splenic tumours occupying half, or even more, of the abdomen; in these cases fatal rupture is apt to occur from comparatively slight accidents. Palpation enables us to detect the extent of the tumour, the direction of its long axis, its form, the outline and characters of its anterior and posterior borders, its moveableness, the effect of posture on its position, its consistence, and the condition of its surface.

Palpation of the stomach enables us to detect pain or abnormal resistance, or yielding in the epigastric region, or below the margin of the false ribs. Pain felt over a circumscribed area and increased by pressure may indicate a gastric ulcer; diffuse pain occurring periodically is more or less common in all other diseases of the stomach. Tumours of the stomach may be detected by palpation when they are somewhat advanced; the pylorus is their most frequent seat. Such tumours often become connected with the liver, and the diagnosis is then rendered difficult. When foreign substances are contained in the stomach, there may be a sense of grating communicated on palpation.

Fæcal accumulations form more or less considerable tumours in the course of the colon; they can be detected on careful palpation. In any suspected case the influence of enemata will often aid the diagnosis.

In peritonitis the slightest touch with the finger causes the most acute pain. Tubercular thickening of the peritoneum may sometimes be detected by palpation. Fluid in the peritoneum gives a sensation of fluctuation. The patient should lie on his back, and while one hand is placed on the abdominal wall, smart taps should be made with the fingers of the other hand at a point a few inches distant. The points to be noticed are the depth or superficial character of the fluctuation, the apparent size of the waves, and the effect of change of posture upon its seat.

Palpation enables us to detect tumours of the kidney, their size, state of surface, consistence, and presence or absence of fluctuation. In "moveable kidney" the organ sinks into the abdominal cavity; this condition is most often found on the right side. It is diagnosticated by the presence in the abdomen of a tumour having the form of the kidney, and by the absence of dulness in the renal region of one side. Such a kidney frequently changes its position, but it can be sometimes grasped between the hands.

Tumours of the ovaries and uterus are generally accessible to palpation. Ovarian tumours generally occupy one side of the abdomen, are more or less spherical in shape and moveable. As they usually contain fluid, fluctuation is a frequent symptom. This, however, is absent when the tumour is multilocular. On the other hand ovarian tumours sometimes appear solid and firm to the touch. In their advanced stages they may occupy both sides of the abdomen, but the history of the case will generally assist the diagnosis. Percussion, also, yields much diagnostic information with regard to these tumours. Enlargements of the uterus appear in the middle line and can usually be detected by palpation during some part of their course.

Percussion is the third method by which the abdomen may be examined. The patient should, as during palpation, lie on his back, with the thighs slightly flexed. The main objects of percussion are the determination of the boundaries of the liver, spleen, and stomach and kidneys. In some cases of abdominal tumours the evidence obtained by palpation is the more valuable, but both methods should always be employed. By means of percussion we are able to estimate the abdominal resonance, whether unusually great or diminished, or replacing dulness over the liver. The points to be noticed with regard to the resonance are: its seat and permanence; its pitch and other special characters, whether tubular, tympanitic, or accompanied by a metallic tinkling sound. Next to the resonance, the dulness due to each organ has to be determined, and with regard to this the points are: its exact seat, extent and limits; the level character or otherwise of its line; the effect of deep pressure and of change of posture, and the difference in sound, if any, produced on deep and superficial percussion. The sense of resistance or elasticity is also to be estimated.

The abdominal organs should be examined in a definite order, and the best one to adopt is to commence with the liver, and then examine the spleen, the stomach, the intestines, the kidneys, the bladder, and other organs. Percussion of the liver has for its object the determination of the position and size of the organ, it enables us to estimate the amount of dulness (superficial and deep), vertical and transverse, and to observe the effect of inspiration, posture or state of stomach or colon on its extent. The lower outline of the dulness, and in cases where the organ is contracted, or where there is much intestinal distension, the resonance over the liver, are points to be ascertained. Absolute hepatic dulness extends on the front of the chest from the sixth rib above to the margin of the arch of the ribs below, and reaches in the median line to nearly midway between the base of the xiphoid cartilage and the umbilicus. The liver should be percussed along four lines, the axillary, mammillary, parasternal, and median. The dulness varies, being much more decided over the upper part of the right lobe than elsewhere. At the lower border of this lobe, a tympanitic sound is heard, by reason of the proximity of the intestines and stomach.

The pathological conditions in the diagnosis of which percussion is serviceable are: the various displacements to which the liver is liable, the enlargement of the organ and its diminution in size. The liver is displaced downwards in some cases of emphysema, and in pleuritic exudation on the right side, it is displaced upwards as a result of pressure from below, as of tumours, &c. Enlargement may be due to cancer, hydatid disease, suppurative inflammation, passive congestion, fatty degeneration, &c., it becomes contracted in cirrhosis and acute yellow atrophy.

In the percussion of the spleen the points to be noted are: the extent of dulness, vertical and transverse, and the form of the organ. In cases of ague the extent of the dulness may be observed to vary during and between the paroxysms. In the normal state (the patient being in the erect posture) the splenic dulness commences at the upper border of the ninth rib and extends downwards to the eleventh rib. Posteriorly the dulness is bounded by the scapular line from the ninth to the eleventh rib, and anteriorly by a line let fall from the middle of the axilla and between the same ribs. As in the case of the liver, percussion enables us to detect displacement, enlargement and contraction.

In percussing the stomach the points to be ascertained are the resonance, its extent, position, and any special character; the dulness, its seat, extent, and permanence; the effect of posture, meals or vomiting upon the signs derived from percussion. The stomach is subject to displacements downwards, as by pleuritic effusion, and upwards, as by tumours in the abdomen. The resonance is decreased when the organ is encroached upon by tumours of the liver or spleen, and increased when the organ is dilated, as occurs in strictures of the pylorus. In percussing the intestines the main point to be noted is the pitch of the tympanitic sound which can always be produced. The colon and iliac regions should be carefully examined, and where marked dulness causes disease, such as a tumour, to be suspected, the effects of defæcation should be carefully noticed. In cases of suspected stricture, or partial occlusion from any cause, water should be injected and the result noticed as regards the length of colon, over which the dulness produced by the water extends.

Effusion within the peritoneal sac may be detected on percussion; when the quantity is large, the sound is dull all over the abdomen, but on deep percussion the tympanitic resonance of the intestines is found to modify the dulness. When the effusion is not so great the latter organs, if distended, frequently project, and the sound over the abdomen generally becomes more tympanitic. Alterations in the position of the body cause modifications to take place in the sounds; the fluid gravitates to the most dependent parts. In the erect position the upper line of the fluid can be made out. It is sometimes important to decide as to how far the effusion reaches. An ovarian tumour has been mistaken for ascites : it is, of course very important to distinguish between the two disorders. The diagnosis is sometimes difficult, and it must be remembered that ovarian tumour is occasionally complicated with ascites, indeed some amount of peritoneal effusion is almost invariably present, whenever the tumour owing to its large size, seriously obstructs the abdominal circulation.

In ovarian tumour, when the patient lies on her back, the umbilical region is the most elevated portion of the abdomen ; it is prominent, rounded and tense, the lumbar regions are less distended. On percussion, the anterior portion of the abdomen is dull, the intestines having been pushed upwards, backwards, and to the sides, and causing resonance in the positions they occupy. In ascites, on the other hand, the umbilical region is (unless the effusion be very great indeed) not particularly prominent, and if the effusion be small in quantity, the region in question will be more or less flat, owing to the fact that the fluid has gravitated to the sides. The sound on percussion also differs, as above explained. In ascites, with slight or moderate effusion, the inflated intestines cause the sound to be clear in the umbilical region and over more or less of the anterior surface of the abdomen. If, however, the accumulation be very large, the intestines cannot rise to the anterior surface of the abdomen when the patient is in the recumbent position, and the same thing will take place if the intestines are extensively glued together. When two diseases co-exist there will be a shallow layer of fluctuation, and beneath this the firm hard surface of the tumour which with stronger percussion will yield distinct fluctuation, but of a different character. The history of the case will, of course, aid the practitioner in coming to a conclusion as to its nature.

Percussion is not of much avail for the determination of the condition of the kidneys. The inferior margin can sometimes be defined, and it is generally possible to detect the outer convex margin, provided that the adjacent colon be empty. In the case of large renal tumours, percussion may be made use of in combination with palpation.

The bladder admits of percussion only when distended; the swelling yields a dull sound, while the intestines around it are more or less resonant. In cases of doubt the finger should be passed into the rectum, when the base of the bladder will be felt there as a rounded prominence, yielding the sensation of fluctuation. If the other hand be placed over the pubes, and pressure alternately made and removed, a wave will be communicated to the finger in the bowel. The introduction of a catheter will, of course serve to determine the nature of the case.

Auscultation is the fourth method by which the abdomen may be examined. It is available under a small number of conditions. The noises heard in the abdomen are called " borborygmi." They depend upon the presence of fluids and gases in the stomach and intestines. It is sometimes important to discover their locality and to note their loudness, and the circumstances under which they occur, Peritoneal friction murmurs and crepitation and grating sounds are sometimes audible in cases of chronic peritonitis. Gurgling is often heard in the iliac regions in cases of diarrhœa. Various murmurs and metallic tinkling are sometimes to be detected in cases of perforation of the bowel. When the gall-bladder contains gall-stones the latter may sometimes be heard to rattle on making pressure over their receptacle. Various murmurs are heard in connection with the abdominal aorta. The points to be noticed with regard to these are: their seat; presence or absence of a tumour; extent and intensity of murmur; the effect of posture in its development; the influence of pressure above and below the stethoscope, and the presence or absence of shock.

Auscultation affords a means of detecting pregnancy. The sounds of the fœtal heart can be heard from about the end of the fourth month; the placental murmur is heard in the second half of pregnancy, and is synchronous with the pulse of the mother. It is sometimes important to determine the seat, loudness, and other peculiarities of these sounds.

DIAGNOSIS.

Diagnosis is the determination from the history, symptoms and physical signs, of the precise nature of the disease in any given patient. It implies a complete, exact, and comprehensive knowledge of the case under consideration. It is essential to accurate diagnosis to pursue definite methods of examination, to extend the investigation over the whole body, and to obtain all important details about the previous history of the case. A complete diagnosis includes the recognition of the presence of a given disease or morbid condition, and the demonstration of the absence of other diseases. The practice of recording cases with their results is an extremely useful auxiliary. The case-taking should be commenced by noting the name and address of the patient, the age, sex, and the nature of the occupation.

Age.—Many diseases occur at a certain age, *e. g.* cancer is most common at a middle period of life; tubercle between twenty and thirty years; gout after twenty-five. Various other examples of diseases occurring at various ages have been given in the former part of this work, in the chapter on Etiology.

Occupation.—The occupation of a patient may lead to important inferences as to the nature of his case (see page 5).

The *family history* should be inquired into as there are many diseases which are hereditary, *e. g.* syphilis, gout, cancer, epilepsy, and phthisis. A knowledge of the habits of the patient assists materially in the diagnosis. Habitual drunkards are very liable to cirrhosis of the liver. Excessive tobacco-smoking leads to indigestion and palpitation of the heart. Sedentary habits combined with large quantities of highly nitrogenous food lead to the development of the uric acid diathesis. The occurrence of previous disease should also be carefully noted. The *general appearance* of the patient is always an important point. In certain diseases the *position* assumed by the patient is almost pathognomonic.

In the next place, the duration of the illness and any supposed cause or causes should be inquired into. Thus it is necessary to decide whether the disease is primary or whether it is secondary to some other malady. The condition of the mind, and the present characteristic symptoms, and physical signs of the disease, as referable to the nervous, the respiratory, the digestive, the circulatory, and the urinary system should also be noted. Thus the state of the skin and pulse, the temperature of the body, the number of respirations, the condition of the tongue, the appetite for food or drink, the state of secretions, urinary and otherwise, must be recorded. The physical signs of the disease should next be noted.

In investigating the history of any case, the patient's account of his symptoms and of the way in which each began, ought to be carefully sifted. The imagination of a patient frequently adds to his conception of the gravity of the symptoms, and the amount of such exaggeration is often a more or less important element in the case. It may be laid down as a good general rule that it is never safe to cast aside as ridiculous any statement of a sane patient. After the personal history the family history should in every case be investigated. It is never without a bearing on either diagnosis or prognosis, and it usually affects both. Diagnosis when most satisfactory or direct determines the precise nature of the disease. Thus high temperature, diarrhœa, and eruptive spots on the abdomen are sufficient to establish the diagnosis of enteric fever. Diagnosis is indirect when it is made by a method of exclusion. Spitting of blood, by itself, is a symptom highly important in consumption, but it is not pathognomonic, as hæmoptysis often occurs in various other affections. There is yet another method of diagnosis known as the differential method. By this method diagnosis is arrived at by taking into consideration all the evidences for and against each disease under dispute. In the case of a floating kidney a tumour is found in the abdominal cavity. It may be mistaken for the distended gall-bladder or a fæcal collection, or an ovarian tumour. When the displaced kidney becomes adherent in an abnormal position, the diagnosis is most difficult.

It sometimes happens that the result of the investigation enables us only to decide that one of several diseases is present. Or we may determine that there is no disease, and that the patient is a malingerer or a hypochondriac. Lovelace, in Richardson's famous novel of 'Clarissa Harlowe,' endeavours to work upon the feelings of the heroine by lying in bed and seeming to bring up a pint of blood. Cases of this kind occur in real life; the detection by the aid of the microscope, of oval blood-corpuscles would expose the imposture.

Cases are often seen, in which it is very difficult to form a diagnosis. The patient may be comatose, and there may be no previous history or any account of the circumstances connected with his case. In such cases the diagnosis must be based solely on objective symptoms, bearing in mind the various causes to which coma may be due, as alcohol, uræmia, rupture of a cerebral vessel, embolism, epilepsy, opium poisoning, hysteria, and nervous exhaustion.

Another case, of a very different nature, but one in which it is sometimes very difficult to form a diagnosis, is that of a woman believed by all her friends to be suffering from a long-continued obscure disease. She looks very well, but after a short railway journey or a drive of a few miles needs to have some refreshment at once, and then to lie down for two hours. A summer's day has reduced her to the verge of fainting. She lies in bed for a week after a single disturbed night. The inhalation of a little tobacco smoke produces dyspnœa and cough, which makes her friends anxious about her life. She needs frequent change of climate, and would die if detained here or there. She is wholly unable to discharge the duties of any station. It is in such cases that the value of a systematic method of proceeding to a diagnosis becomes apparent. The physician goes slowly over each point in order, omitting nothing, repeating, it may be, his observations several times, and thus at last comes to the irrefragable conclusion that the patient who, after a supposed illness of a dozen years or more, and has no wasting of tissues, no rise of temperature, and no sign of disease of the heart, lungs, or other organ, is suffering from the common moral defect of extreme self-indulgence, and from no disease in the list of the College of Physicians.

Various instruments are employed in the numerous exploratory processes necessary for making a diagnosis. Thus inspection of certain organs is facilitated by the use of specula. These instruments are employed for the examination of internal organs and parts, as the uterus, rectum, and throat. Another instrument of this kind is the endoscope, by which the interior of the bladder can be examined. The laryngoscope has been already referred to. The ophthalmoscope often elicits important evidence in diseases of the nervous system. The stethoscope is so well known, and its uses are now so well understood, that any general description of the manner in which the instrument is employed would be superfluous. The pleximeter and the measuring tape are often associated with it. The spirometer, the sphygmograph, and the thermometer have their appropriate uses. Chemical and microscopical examinations are often of great service in the diagnosis of disease. Improved methods of examination, physical and chemical, the progress of pathological anatomy, and the practice of experimental pathology are the principal causes of modern advance in the science and art of diagnosis.

PROGNOSIS.

Prognosis is the determination of the probable event, and is a conclusion depending in part on the diagnosis, but of course liable to change, without corresponding alteration in diagnosis. To form a correct prognosis of disease is one of the most difficult tasks in the practice of medicine. Prognosis determines the probable result of a disease and its duration; and more minutely whether it will end in death, complete recovery, or imperfect recovery, with impairment of health or of any special function of the body. In the case of a disease likely to end fatally, prognosis determines whether it will end suddenly or slowly, and whether by syncope, asphyxia, or coma. This knowledge can best be acquired by a long course of study of disease in all its forms and complications, and by a careful consideration of the history and individual peculiarities of the case. It is, above all, necessary to avoid prejudice, and the idea that this or that circumstance obviates the necessity of further thought, and that the case is absolutely hopeless, or perfectly certain to turn out trivial. Errors in prognosis most often arise from trusting too much to loose general principles, and from considering one symptom and not all the symptoms. In order to form a correct prognosis, it is the physician's duty to collect and compare the therapeutical experience of competent men, and to draw his conclusions from data recorded by them, and from his own previous experience. The remarks of Hippocrates, though more than two thousand years old, are felt to be true by every practitioner of our own time.

"The best physician appears to me to be he who knows how to know in advance. By ascertaining and explaining before the sick the present, past, and future of their diseases, and by completing the history when they have left anything out, he will gain their confidence, and, convinced of the superiority of his intelligence, they will not hesitate to trust themselves to his care."

The prognosis is favorable in the majority of acute and recent cases treated under suitable conditions. In many chronic diseases the prognosis (at least as far as regards recovery) is far less favorable. It becomes absolutely bad in old people and in neglected cases, or when, besides adynamic symptoms, the case is attended with complications. In some chronic cases, while the patient continues fairly strong and maintains his digestive powers, a hope may be held out for a tolerably comfortable existence for years. Where the disease is secondary to some other grave disorder, the prognosis chiefly depends upon the nature of the primary affection.

In forming a prognosis it is necessary to consider not only the disease itself, but any peculiar circumstances which may modify its course. Age, sex, mode of life, circumstances of the patient, place of residence, time of year, previous state of health, &c., all more or less influence the prognosis. It often happens that diseases are peculiarly dangerous under certain peculiar influences, and anything which tends to augment the gravity of the disease renders the prognosis more or less unfavorable. Extreme old age, habitual intemperance, and excesses of various kinds, debility from previous disease and other causes, the co-existence of disease in other organs, or of constitutional disorders, *e.g.* syphilis, scrofula, &c., are circumstances which almost invariably lessen the prospects of recovery in severe cases. On the other hand, youth, temperance, previous good health, and the absence of any constitutional taint or tendency, are, in a general way, favorable circumstances as regards prognosis. Besides all these intrinsic conditions, the extrinsic accident of the patient's circumstances in life materially influences the prognosis. Thus a man who suffers from valvular disease of the heart, and has to work with his limbs for his daily bread, has little prospect of a prolonged life.

Certain symptoms may generally be considered as extremely unfavorable. Dropsy in chronic diseases, great emaciation, complete absence of the cardiac impulse, sleeplessness, delirium, stupor, great prostration, the state of coma-vigil, muscular tremors, urgent and protracted hiccup, a very high or a very low temperature, are symptoms of this character.

COMPLICATIONS.

Most diseases have a distinct course, which may be definite or indefinite, prolonged or interrupted. This of course depends upon a distinct series of pathological changes, regularly succeeding one another. When the series of changes is interrupted, or when it runs parallel with other changes, a *complication* is said to occur, and particular complications have a tendency to occur in particular diseases. Thus renal dropsy is a frequent complication of scarlatina; bronchitis and pneumonia of measles; pericardial and cardiac diseases of acute rheumatism; kidney disorder of gout; while enlargement of the liver and spleen frequently complicates malarious fevers. Many cases of continued fevers present complications which modify the character and course of the disease, and are due for the most part to the weakened condition of the heart and the poisoned condition of the blood. These complications are the cause of death in many cases. They occur in almost all the organs of the body, one kind of fever being more liable than another to certain complications. Thus bronchitis is a frequent complication of typhus, and peritonitis of typhoid fever.

SEQUELÆ.

The morbid changes which produce disease may altogether pass away and be replaced by a healthy condition of the system generally, or they may be succeeded by other morbid conditions dependent upon the state to which the first series has reduced the organisation. Such further dependent changes or diseases are called *sequelæ,* and peculiar sequelæ occur in the same way as peculiar complications. Thus otitis interna is a sequel to be expected after scarlet fever; otorrhœa is a sequel of measles; paralysis of the fauces and pharynx, of diphtheria. An anæmic condition is a frequent successor of severe febrile attacks.

The term *sequelæ* is sometimes loosely used to express actual results of the primary disease, though that may have ended and no other come on. Thus pigeon-breast is spoken of as a sequel of whooping-cough, but is really a mechanical effect of the whooping-cough, and is not due to any secondary disease. It is not always possible to distinguish between a complication and a sequela, inasmuch as many morbid conditions, arising during the course of a disease, continue to develop after the latter has subsided. Thus tubercular deposit sometimes takes place in the lungs and elsewhere during the course of typhoid fever, and is then a complication. After the fever has run its course, the development of tubercles continues, and pulmonary consumption is the result or sequela. Instances of this kind are very numerous, especially in connection with febrile disorders.

Terminations of Disease.

A disease may terminate in convalescence and recovery, in some other form of disease, or in death. An acute disease may also pass into a chronic form. Of these terminations, convalescence followed by recovery is by far the most common. Convalescence is sometimes sudden; such a termination is occasionally seen in nervous affections; it is, however, much more frequently a slow and gradual process. Such is invariably the case when the patient's strength has been exhausted by the severity of the attack and its long duration. In many acute diseases the first indications of convalescence are moistening and cleaning of the tongue and diminished frequency of the pulse. Restoration of the normal secretions, especially of the skin, is another favorable indication; improved appetite and re-establishment of normal function follow in due course. Convalescence may proceed uninterruptedly, or may be checked in consequence of the condition of organs other than those implicated in the original disease. Nervous symptoms often become prominent, the appetite flags, and the heart's action is feeble or unduly excitable. These symptoms usually disappear spontaneously, and the patient's health is restored to its former standard. It not unfrequently happens that a patient acquires increased vigour of mind and body after recovery from a severe illness.

Convalescence is sometimes interrupted by the return of some or all the symptoms of the disease. This new attack is called a *relapse.* Relapses seldom or never occur in certain febrile diseases, such as smallpox, typhus, and scarlatina, while they are not very uncommon in typhoid. In relapsing fever the recurrence of the symptoms gives the name to the disease. In this complaint relapses occur in 70 per cent. of the cases. Certain other diseases are very prone to relapse, as rheumatism in its various forms, intermittent and remittent fevers, &c. A relapse is sometimes more serious than the original attack, in consequence of the patient's strength having become reduced by the previous suffering.

Cases often occur in which the convalescence is imperfect, and it sometimes happens that a tendency to a new disease becomes developed. Thus a person suffering from a very severe attack of remittent fever with typhoid symptoms may shake off the fever, but gradually loses flesh and strength in consequence of the development of pulmonary consumption. The same affection often follows measles. In another class of cases some important organ has become implicated, *e.g.* the heart in acute rheumatism, and the kidneys in scarlatina, and the consequences of these secondary disorders retard or altogether prevent convalescence. General anæmia is a common sequela of a numerous class of disorders, and it sometimes remains a permanent condition. In some cases convalescence is imperfect owing to the setting in of a chronic stage of indefinite duration. Acute bronchitis, for instance, frequently passes into a chronic form, the patient during his whole lifetime continuing to exhibit more or less marked evidences of the complaint. Some forms of rheumatism, and catarrhal affections in general, are very liable to become chronic.

The termination in death takes place either by gradual exhaustion of the vital powers in general, or as a result of the failure of one or more of those organs, the action of which is necessary for life, viz. the brain, the heart, or the lungs. In general terms, it may be stated that when death is the result of the condition of the brain, the final symptoms are those of *coma.* Death dependent upon the state of the heart is ushered in by symptoms of *syncope,* while obstruction to the flow of blood through the capillaries of the lungs is the cause of death by *asphyxia.* This last-named condition often results from affections of the nervous system, causing cessation of the movements of respiration. A disordered condition of the blood is another cause of death. Examples of this are afforded by uræmia and pyæmia. The poison circulating in the system impairs the activity of all the vital processes, the heart's action is weakened, the nervous system is profoundly depressed, and the changes in the systemic capillaries cease at last to take place. This condition is called *necræmia.*

Various symptoms precede the advent of death. The form which these assume depends to some extent upon the organ especially implicated, but there are certain groups of symptoms which mark the close of many diseases, differing widely in other respects; the most prominent of these is that which has been designated the *typhoid state.*

Typhoid state.—The typhoid state is common towards the fatal end of many diseases, and exists from the first in a few affections. Its symptoms resemble those of the later stage of typhus fever. The diseases in which we most commonly meet with this state are erysipelas, carbuncles, severe acute inflammations, as pneumonia, specific fevers, acute atrophy of the liver, chronic Bright's disease, and all disorders in persons accustomed to habitual excess in alcohol. The patient lies on his back, sinks to the bottom of the bed, and has a low muttering delirium, his face is shrunk and ghastly-looking, and he is unconscious of all around him. The *skin* is somewhat livid, shrivelled, cold, and covered with profuse, often fœtid sweat; the lips parched; the *tongue* brownish-black and contracted, with sordes about the teeth and gums. There is *difficulty of swallowing*, and he mutters in a hoarse inaudible voice; his respirations are shallow, and somewhat accelerated. The *pulse* is rapid, feeble, or even imperceptible. The bowels are irregular, and urine scanty, high-coloured, and full of urates; or there may be retention. *Bed-sores* are apt to form. If told loudly, he will half open his eyes, and if urged, perhaps will take a morsel or two of food, and soon falls back into his unconscious state. He picks at his bed-clothes, his limbs are tremulous, and often, in advanced cases, he unconsciously passes his urine and fæces in bed. Gradually stupor or coma supervenes. The *temperature* is generally below the natural heat, except when the condition is due to rheumatism; it then may rise as high as 110°.

This state is to be explained pathologically as due to some *poisonous* matter in the blood. In local inflammations the morbid products are generated in the affected part, and thence carried into the general circulation. It is probable that the poisonous matters are sometimes products of the disintegration of tissues into urea and the like, which accumulate in the blood and act as a poison. The latter hypothesis is supported by the fact that urea has been found in excess in the blood on post-mortem examination.

In many exhausting diseases, as diarrhœa and phthisis, and in others in which there are excessive discharges or hæmorrhages, death results from a protracted form of syncope, named *exhaustion* or *asthenia*, the condition being due to weakening of the heart's power, and alterations in the quantity and quality of the blood.

In this termination death results from failure of nutrition and of circulation of the blood.

The failure of nutrition may be due to actual starvation, as in obstructive diseases of the œsophagus or stomach, preventing food from entering the alimentary canal, and as in various organic disorders of the stomach and bowels. It may depend on diabetes, or malignant disease, or on wasting discharges, or on fevers, or any other condition where there is a great disproportion between the waste and the nutrition of the tissues of the body. In such cases there are characteristic signs of the approach of death. These are profound weakness and shivering, especially on the least exposure to cold. Where the debility is extreme the patient is often insensible to surrounding objects, he lies listless and motionless, with hands, face, and feet cold. The pulse is barely perceptible, the breathing slow and laborious, and there may be involuntary passage of urine and fæces. The thermometer always indicates a very low temperature.

Syncope or *collapse* is much more rapid in its occurrence. The failure of the heart's action may arise either from loss of propulsive power, or from the supervention of "tonic spasm," the organ remaining rigidly contracted, and no dilatation taking place.

Causes of syncope.—Circumstances which lead to abnormal emptying of the cavities of the heart, as rupture of the heart or of great vessels, obstruction in the principal veins, or sudden removal of pressure from the great vessels, as by operation of paracentesis for abdominal dropsy; rapid escape of blood from various organs, as the stomach, bowels, uterus, or lungs; want of an adequate supply of blood or the supply of impure blood to the substance of the heart, as blood containing urea; paralysis of the muscular fibres of the heart; degeneration of the heart from any cause. Various other causes act by producing a sudden shock to the whole system, first disturbing the nervous centres. These are —strong mental emotions or depressions; severe burns; severe brain lesions; severe blows on the pit of the stomach causing sudden and excessive pain; sudden drinking of cold water when heated; operation of irritants or poisons upon the stomach; lightning; angina pectoris; and pressure of pericardial effusion.

Pathology of syncope.—There are three factors in the production of syncope. 1. The depression of temperature is partly due to failure of proper circulation of blood in the parts exposed, as the extremities and face. The fall of the temperature of the internal organs is chiefly due to the arrest of the disintegrating processes, and also of the vital processes upon which the maintenance of the temperature chiefly depends. 2. Feebleness of circulation or failure of proper circulation of blood is due to cardiac debility, to cardiac spasm, or to diminished supply of blood to the left cavities of the heart, and thence to the general circulation, or to obstruction of one of its orifices by clots. The pulmonary artery may be obstructed by thrombosis, and in this case we find weak, or even imperceptible pulse at the wrists, and paleness of the surface. In collapse from loss of blood the right cavities of the heart are found distended, those of the left side are contracted and empty. In cases of sudden death due to emboli the heart is contracted and empty, or if the walls are paralysed the left cavities are dilated and contain coagula. 3. The nervous system is interfered with, and especially the sympathetic nerve which presides over nutrition, secretion, and circulation in the various organs. In a large proportion of cases of collapse a variety of phenomena are referable to the nervous system. In the case of an hepatic abscess opening into the peritoneal sac, collapse sets in, the changes going on in the system are directly interrupted, the temperature of the body is reduced, and the heart's action is arrested.

Symptoms.—When collapse is sudden and complete, if the death is delayed the patient falls forward, there is complete insensibility; the extremities are cold and pallid; the face pinched and shrunk, occasionally livid, often bedewed with sweats; there is dilatation of the pupils; cold, clammy skin; slow, irregular, and weak, or frequent and irregular, or imperceptible pulse; respirations sighing, laborious, infrequent and irregular. In some cases there is hiccough, vomiting, and delirium. Very often in sudden insensibility convulsions set in, and the sphincters act involuntarily. The heart beats very feebly, and there may be absence of impulse and sounds. In severe cases, as in cholera and in low fevers, the patient lies motionless, with eyes half closed and slightly twitching, looking like a corpse. There is a fall of temperature to about 92°. Collapse is a variety of syncope. Syncope is more severe, more rapid in its course, and is sudden in its onset. When collapse is gradual there is a sense of giddiness, trembling, and faintness, sinking at the epigastrium, a feeling of oppression about the chest, nausea and vomiting; the skin is cold and perspiring; in some cases shiverings occur or a sense of heat. The pulse becomes irregular, slow, and weak; the large arteries throb; breathing becomes gasping and irregular, and sometimes hurried; there is restlessness, confusion of mind, and even disorder of special senses. These cases last a variable time, and terminate either in death or recovery. Where the progress of coagulation is slow, the blood collects in the capillaries and veins and leads to dropsy, hæmorrhagic infarctions and local thrombi and the parts farthest removed from the heart may become gangrenous. If recovery takes place there is more or less reaction, the skin resumes its original colour and smoothness, the circulation returns, and the temperature rises from 92° to 98·4°. Very often febrile phenomena manifest themselves.

Treatment.—The cause must be sought for and removed. During the fit the patient should be put in a horizontal posture, with the head low. All clothes should be loosened and fresh air admitted. The vitality may be restored by dashing cold water on the face, by the application of ammonia to the nostrils, a mustard plaster to the precordia and to the calves, and rubbing stimulating liniments or powdered ginger on the extremities. Stimulants as ether, ammonia, brandy, and wine may be given internally.

Death may also be due to *the cessation of the proper discharge of effete materials*, and their consequent retention in the blood. Poisons of this character are carbonic acid, which should be evolved by the lungs; urea and other nitrogenous products, which should be eliminated by the kidneys; and various constituents of the bile, which are secreted by the liver. When carbonic acid is retained in the blood for a sufficiently prolonged period, the condition named *asphyxia*, or more correctly *apnœa*, ensues.

Death from *apnœa* is a common termination of fatal disorders, and is often witnessed in diseases of the lungs, in cases of mechanical obstruction to respiration, and of paralysis or spasm of the respiratory muscles, and when air saturated with carbonic acid is respired asphyxia may be suddenly or gradually produced. *Acute asphyxia* is the condition which occurs in death by drowning, choking, hanging, and the like, and in bronchitis and tetanus. In it the dyspnœa is extreme and violent, and is soon followed by vertigo and unconsciousness. Convulsions occur, and in a few minutes all respiratory muscular actions cease. The heart continues to beat even after cessation of respiration. In suffocation the blood is non-aërated. It is impelled through the vessels of the lung, and through the systemic vessels with great difficulty. Thus less blood reaches the left heart, and less is, therefore, propelled into the arteries, and consequently more is retained in the veins. As a result the pulmonary veins and systemic arteries are comparatively empty. The right side of the heart and the systemic veins are gorged with blood. In slow and protracted cases of suffocation, as occurs at the termination of chronic bronchitis, the surface of the body becomes livid and swollen, and superficial veins enlarged; the pulse is quick, feeble, and intermittent, with great dyspnœa and anxiety. Gradually the patient becomes drowsy, comatose, and sinks. In poisoning by urea and other effete matters, as bile, the progress is often slow, there is more or less anæmia, and dropsy, with deranged nervous functions, as evidenced by delirium, convulsions, and coma.

Death by coma.—In failure of nervous functions death occurs at once by coma. There is profound unconsciousness and stertorous breathing. Saliva and other secretions accumulate in the respiratory passages and are not expelled and the patient dies asphyxiated. In many cases death is due to spasm or paralysis of the respiratory muscles, causing apnœa. Thus in some cases of epilepsy the spasm of the glottis, and in tetanus the spasm of the diaphragm, stop breathing and cause death. The stertor which occurs in coma may be palatine, pharyngeal, or mucous. The palatine stertor arises from the vibrations of the soft palate, the pharyngeal from the gravitation of the tongue to the back of the pharynx, and the mucous stertor from the presence of mucus in the large air-tubes.

A general account of coma and its causes will be found at page 56. It remains to add a description of its varieties and the symptoms they present.

The sympathetic system of nerves exercises a direct control over the circulation of the blood and the secretory, excretory, and other nutritive processes which constitute life. In coma death is said to begin from the brain and cord, but the patient dies asphyxiated; or death may be due to the paralysis or spasmodic contraction of the heart and blood-vessels which are subject to the influence of the sympathetic. In extreme cases there is profound unconsciousness. Coma may occur suddenly or more or less slowly. Sudden coma is a symptom in some forms of apoplexy, and is known as apoplectic coma. The chief points of inquiry relative to coma are: the *number of respirations*, the quality of the breathing and its effects upon the blood, as evidenced by the colour of the lips. In most stages of coma the breathing is slow, irregular, and heavy. It may be stertorous or wholly diaphragmatic. *The pulse* may be noted with regard to the frequency, quality, and irregularity; it is usually slow and labouring. *Reaction of the pupils* may be tested by separating the eyelids and examining the pupils as to their condition—whether contracted, dilated, irregular, or unequal. *Reflex irritability* may be tested by tickling the soles of the feet. *The temperature* is remarkably low in uræmic coma and in grave concussion of the brain. The face is pale, or congested and livid. The skin moist and cold, or in some cases pungently hot. In coma due to alcohol or epilepsy the temperature is often normal or varying but little from the natural standard. In all fatal cases of coma the secretions from the mouth and air-passages are retained and the patient dies from asphyxia or apnœa from spasm of the respiratory muscles.

Varieties.—Coma is found in a variety of diseases and its symptoms vary with each individual case. Very often patients are found in a state of coma in the streets, without any clue as to its cause. Coma occurs slowly in a variety of affections, as drunkenness, epilepsy, hysteria, and opium poisoning. It is also of slow appearance in passive congestion or hyperæmia of the brain. In this latter class of cases coma is preceded by a feeling of dulness, with tendency to incomplete and unrefreshing sleep. Congestion is best observed in cases of dilatation of the right side of the heart, in aneurisms pressing upon the superior vena cava and in fits of epilepsy.

Coma of apoplexy due to active hyperæmia.—It may be complete or incomplete ; if the latter, the patient can be roused to partial consciousness. When the coma is profound the respirations are stertorous, the pulse is slow and labouring, and the lips are livid. As a rule hemiplegia is absent. The condition may continue from a few minutes to several hours. There is generally a history of headache, giddiness, flushed face, of great sensitiveness to light and sound, of strong pulsation of the carotids, of great restlessness, sleeplessness, and mental excitement.

Coma of extravasation.—It is generally sudden as if the patient were struck down by a blow or by lightning. The coma is perfect ; there is complete loss of consciousness ; the breathing is stertorous ; the cheeks alternately swell and are drawn inwards during the respiratory act. The pulse is slow and somewhat irregular ; vomiting often occurs. The temperature is high. In some cases there are symptoms of active hyperæmia of the brain. In others the face is pale ; pulse feeble and irregular. Hemiplegia is a constant accompaniment in this coma. Reflex irritability is greater on one side than on the other ; the pupils are unequal. It rarely occurs before forty.

Coma due to hæmorrhage or effusion of pus on the surface of the brain.—This commonly occurs in cases of fracture or any direct injury to the cranium. In hæmatoma of the dura mater and in meningeal hæmorrhages the coma is sudden, the pupils contracted or often unequal on the two sides ; the breathing is stertorous. In a few cases hemiplegia occurs ; often the extremities are stiff ; there is profuse perspiration ; the temperature is normal or slightly above it ; there is no response to electricity. In fractured skull there is frequently bleeding or oozing of bloody serum from the ear or from the nose. There is often ecchymosis of the eye.

Coma of embolism or thrombosis of cerebral arteries.—In embolism the middle meningeal artery is generally implicated. The affection is more common on the left than on the right side. The coma is sudden and associated with symptoms of cerebral hæmorrhage. Coma of embolism occurs before forty. There is hemiplegia of the right side associated with aphasia. Such cases are complicated with valvular disease of the heart. There is often a previous history of rheumatism. Coma from embolism is rarely fatal. There is rapid and complete improvement from hemiplegia.

Coma of thrombosis occurs in cases of occlusion of the basilar artery. In this coma the patient dies in a few hours. There is no hemiplegia.

Coma of insolation.—The symptoms are those of cerebral hyperæmia. The temperature is very high, sometimes as high as 110°. It is common within the tropics and often due to exposure to solar heat.

In *coma due to cerebral exhaustion* the condition is transient. The pupils are natural; no stertor, no paralysis; the pulse is regular. After a time the recovery without any bad symptoms follows. No signs of heart disease.

Coma of brain-poisoning.—Coma due to brain-poisoning or deficiency of oxygen in the blood. In the inhalation of laughing-gas, of sulphuretted hydrogen, or of carbonic oxide gas, and in pulmonary congestion of both lungs, the face is more or less dark, the veins turgid, the skin hot, the reflex irritability heightened. Protracted inhalation of carbonic oxide gas arrests the oxygen-carrying properties of blood-cells, and this change, if profound, is not recovered from.

Coma of drunkenness.—Coma of drunkenness, or alcoholic intoxication, is known by the history of the case, and the patient can be roused; as a rule the insensibility is not complete; there is odour of alcohol in the breath owing to its elimination by the lungs. Vomiting usually takes place, the vomited matter has the odour of spirits. The respirations are slow and either noiseless or stertorous. Face is pallid or congested, and livid. The urine is frequent and limpid. The temperature is normal or somewhat low. The muscular power is lost, so that the limbs when raised fall without resistance. The pulse is small, frequent, and feeble. The pupils are dilated. On recovering consciousness hearing is restored before vision.

Coma of uræmia.—As a rule, it is preceded by drowsiness passing into somnolency. It may be sudden; the existence of renal disease may not have been suspected before the seizure. In this disorder epileptiform convulsions often accompany coma; they continue for a long time with remissions and intermissions, and the patient becomes comatose. In epilepsy the coma disappears, the urine is not albuminous. In uræmia the urine is scanty, albuminous, except if there be cirrhotic kidney; it is of low specific gravity and deficient in urea. There is a smell of urine about the patient. The coma is profound, with remarkable intermissions, and there are muscular twitchings. The face is pale and wax-like; conjunctivæ pearl-like, the pupils more or less dilated, and the temperature remarkably low, about 93° or 94°. There is slight œdema of the eyelids or extremities; there are also bronchitic sounds, foul breath, a brown and furred tongue, and dilated pupils.

Narcotic coma—coma of opium.—There is profound stupor preceded by deep sleep, closed eyelids, upturned eyeballs, the pupils are contracted and immovable; the face is pale or cyanosed, skin cold and moist; the respirations are slow and infrequent, the forehead beaded with heavy perspiration; limbs are lax, and reflex irritability cannot be readily excited. After a time respirations diminish in frequency and may be very slow, only six or eight in a minute. The pulse is small, soft, and weak, about 80. In advanced cases coma is profound—pricking, galvanism, loud speaking, &c., have no effect in procuring either response or muscular movements. The lips become livid, the surface of the body is cold, the breathing very shallow, and the pulse barely perceptible. The condition terminates in death by asphyxia. There is the odour of opium in the breath and in the vomited matters.

Coma of serous effusion into the ventricles.—In it the coma is profound. It is best noticed in renal or cardiac dropsy, and in tubercular meningitis. The coma comes on gradually, and is preceded by a stage of sopor; the individual is sleepy at first, then dreamy, difficult to arouse, and finally incapable of being roused at all. Reflex movements can be excited for a while, later on there is loss of voluntary motion and sensation, the face is pale, the surface moist, the pupils are not characteristic, but often dilated, and the temperature falls. The breathing is stertorous, and is principally diaphragmatic. At first deglutition is perfect, gradually it is impossible for the patient to swallow.

Coma of epilepsy, or that which succeeds an epileptic fit or convulsion. There is usually an account of former epileptic seizure. There are often bruises on the body and marks of dirt on the clothes, and frothy saliva coloured with blood about the mouth, indicating that the tongue has been bitten. On recovering consciousness the patient is in a dreamy state, he hears questions correctly and answers them rationally, but soon forgets what he has said. There is no hemiplegia.

TREATMENT.

Treatment is the practice of the science of therapeutics which teaches us how to cure, relieve, or prevent diseases. A laborious attention to minute details is essential to successful treatment.

The practitioner should avoid falling into the danger of a routine mode of treating diseases. He has to consider each case on its own merits, and to bring his knowledge and observation to bear upon the nature of the case, and to use his discretion and common sense in varying or modifying the treatment indicated by the known course of the disease. But in cases where death is inevitable, we must try to prolong life or to make the condition of the patient as comfortable as possible for the short space of his existence. In all cases attention must be paid to the general health of the individual, and to the warding off of possible complications. If the various maladies are constitutional disorders they must, if possible, be rooted out from the members of a family; if of a contagious nature, they must be eradicated from the midst of communities.

The ultimate aim of a physician or a practitioner is to adopt such methods of treatment as may lead to recovery with perfect restoration of health. In many cases this end cannot be attained. In such cases the practitioner should try to alleviate as far as possible the existing morbid conditions, to lessen the discomfort or the suffering they entail, and should make every effort to prolong the life of the patient.

When called upon to treat a case, the first step to be taken is to attempt to remove the causes which may still be in operation. Where the disorder is due to specific causes, further exposure to them must as far as possible be avoided. Our next object is to cut short or arrest the disease. This may sometimes be attained by the use of certain remedial agents; various drugs may be mentioned which serve to effect this purpose. Thus, quinine is an abortive agent for the arrest of malarial fever. In every case attention must be paid to relieve the symptoms, and this object is effected by employing those measures which are known as palliatives. Thus, opium is given to relieve pain, antipyretics to lessen the heat of the blood; chloroform is given by inhalation with a view to check spasms, as in convulsions.

Lastly, the practitioner should endeavour to prevent the further progress of a disease or to cure the malady. Various measures are employed which thus modify the intensity of the disease. Certain drugs possess a controlling influence over certain diseases. Thus salicin is a highly useful agent in the cure of rheumatism, colchicum and alkalies in gout, arsenic in various kinds of skin-diseases and in neuralgia, mercury and iodide of potassium in syphilis, ipecacuanha in dysentery, &c.

There is yet another method of treatment known as supportive. There are many acute diseases, as typhoid fever, typhus fever, pneumonia, &c., in which there is often extreme prostration from the first. Such cases, if neglected, generally prove fatal, and death results from asthenia or exhaustion. Special attention must be paid to the state of the circulation, and the heart's action must be supported by alcoholic stimulants, and by light, nutritious, and liquid food perseveringly administered.

All methods of treatment are comprised under two main heads. These are therapeutics and general hygiene.

Therapeutics.—In treating diseases it is a good rule to prescribe as few drugs as possible in combination. It is impossible for a practitioner to observe the effects of each drug when half a dozen or more are employed at one time. Those which are repulsive to the taste and smell are best administered by making them into confections or pills, or placing them in capsules.

By *therapeutics* is meant the administration of medicines, either by the mouth, by subcutaneous injection, by means of baths, by inunctions, by suppositories, by enemata, or by inhalations.

The action of certain drugs appears to be different according to the mode of administration. This difference is shown in the comparative rapidity and intensity of the effect of the drug according as it is given by the mouth, rectum, or hypodermically. By whichever mode a drug is introduced into the system a general effect is the result. It has been observed that where absorption is very rapid the effective dose of the drug is always small in proportion to the usual dose requisite for a general effect. A smaller dose is usually required if the drug is introduced directly into the blood-vessels. In the latter case the loss from retention in the tissues is extremely small. The lungs possess great capacity for absorption, owing to the special arrangement of their blood-vessels. Hence certain medicines can be introduced into the system by inhalation or fumigation, and this mode of administration closely resembles the immediate introduction into the blood. Mercury and all substances which are readily volatilised can be thus administered. The treatment of various diseases of the lungs is often materially assisted by causing the patient to inhale the vapour of water charged with remedies of an antiseptic, astringent, or soothing character.

There is one method of administering nourishment which, owing to its great practical value, is eminently worthy of adoption in cases of immediate or prolonged emergency where a little addition to the nutrition of the system may turn the scale in favour of life. The method referred to is that of administering food by the rectum, *rectal alimentation*, as it is called.

In acute fevers there is a large waste of tissue with very little nutritive activity. Similarly in chronic cases, as phthisis, the enormous and pernicious metamorphosis of tissues prompts the physician to adopt measures which would aid nutrition. Again, in cases of alarming hæmorrhages, there is exhaustion of the whole organism.

In chronic and prolonged anæmia we are called upon to suggest a method of treatment, having for its object the nutrition of the patient.

In many of these cases the functions of the stomach are very imperfectly discharged or are altogether in abeyance. We are compelled to resort to various plans for the administration of food by the rectum, by the skin, and by injections into the blood itself.

By the rectum.—In this method of feeding, nutritive and stimulant enemata are employed and are often of extreme service. Hot water enemata, too, have been administered in cases of collapse. Injection of a weak saline solution into the veins is similarly recommended in cholera-collapse. It must be remembered that when alcohol and other diffusible stimulants are added to fluid nutritive enemata containing solutions of albumen, the latter is coagulated and the enemata become comparatively useless. Again, the rectum, be it remembered, has no power, like the stomach, of preparing albuminous bodies for absorption, only a small portion of albuminous solution becomes absorbed by dialysis into its venules. Milk is also very sparingly absorbed by the rectum.

In order that the albuminous constituents of nutritive enemata may be more readily absorbed, they should be administered in the form of peptone, a preparation resulting from the action of pepsine or pancreatine upon albuminous bodies. Thus one part of pancreas and three parts of minced mutton, with warm water added to form an enema, may be given by the rectum. Pancreatic extracts are better than pepsine as peptonising agents. Another method of administering food by the rectum consists in the use of blood itself, so that both the blood-corpuscles and serum may be absorbed. It has been observed that three or four ounces of defibrinated blood when injected into the rectum leave no trace in the evacuations passed after some hours. Blood-enemata tend to check any tendency to diarrhœa which may then be existing. The enemata are supposed to act by a sort of retrograde peristaltic action, whereby the materials are absorbed by a large area of the mucous surface of the bowels. The blood so employed should be defibrinated. It should be what the butchers call stirred blood. Fresh blood is of more benefit than that which has been kept for some time. That obtained in tins, "sanguis bovinus exsiccatus," is highly useful for purposes of injection. It is soluble in water at a temperature below 160° F. One fluid drachm is equal to one ounce of ordinary blood.

Defibrinated blood has been employed in a variety of cases. In gastric ulcers its effects are often very beneficial. In profuse hæmorrhages, where every trace of food is rejected by the mouth, the desiccated blood injected into the rectum acts like a charm. In dyspepsia, with extreme irritability of the stomach, a teaspoonful of blood injected into the rectum every six hours will often relieve epigastric pain and vomiting in a few days, and will also produce an increase in weight.

General hygiene.—It implies a careful attention to the diet as regards the nature of the food and drink, its total quantity and quality at a given time, and the interval at which each meal should be taken. It includes the use of alcoholic stimulants, which should never be employed in an off-hand way. General hygiene has an important influence in the treatment of diseases, and for this purpose various details connected with it should be considered, such as the place of residence, habits of life, occupation, exercise, change of air and climate, ventilation, &c.

Rest is essential in the treatment of disease. By it nature tends to repel the attacks and also completes the work of repair. In many affections of the nervous system, prolonged rest in the horizontal posture, coupled with easily assimilated nourishment, forms a very important element in the treatment. In diseases of the heart and blood-vessels repose of mind and body are always to be advocated. In diseases of the respiratory system rest is obtained by avoiding conversation and by the use of nervine sedatives. The sedatives act by relieving the irritable state of the respiratory tract of the medulla.

Alimentation.—In acute diseases and in specific fevers there is no desire for any solid food, the patient should therefore be kept on a light nourishing and liquid food, consisting chiefly of milk, half boiled eggs, and gruel and broths.

Temperature and ventilation.—It is extremely desirable that the sick-room should in every case be thoroughly ventilated and the temperature never allowed to become very high. A cool atmosphere is always refreshing and invigorating to the sick. In the treatment of fever, abundance of fresh cool air is one of the most important conditions. Wherever possible, the temperature should average 60° ; draughts are to be avoided, but cold air is much less injurious than a close vitiated atmosphere.

Change of climate.—Various chronic diseases are much ameliorated by change of climate. Convalescence also from acute disease is generally expedited by change of air and scene. The effect produced by change upon the mind of the patient is an important element. The neighbourhood of the sea is especially beneficial in consequence of the purity of the air. Sea-air almost invariably causes an increased appetite and thus augments the patient's strength.

DERANGEMENTS OF THE BLOOD.

ANÆMIA.

Anæmia signifies deficiency of blood. The blood is thin, watery, light in colour, and drawn with difficulty. Under the microscope the red corpuscles are seen to be much diminished, they are reduced from the normal proportion of 130 per 1000 to 50, or even lower. They remain in groups, and are pale in colour; some are crenated, others are irregular in shape and size. Chemically the liquor sanguinis is found to contain less albumen and more salts.

There are three principal varieties of this condition—simple anæmia, chlorosis, and pernicious anæmia.

Causes.—Those conditions which retard or prevent the formation of healthy blood give rise to anæmia; as impure air, dark and ill-ventilated rooms, scanty food or clothing; chronic serous discharges acting as a gradual drain upon the system, as in piles or in protracted diarrhœa; hæmorrhage due to disease or injury; profuse watery or albuminous discharges, as in cholera; long-continued exposure to malaria or other poisons, or the use of poisonous drugs as mercury, antimony, and lead, for a long period; acute fevers, repeated pregnancies, over-lactation, venereal and other excesses, residence in hot damp climates. It is common in persons residing within the tropics. Females are more subject to it than males. Anæmia is often dependent on organic disease, and is a frequent symptom of cancer and chronic diseases of the heart and kidneys.

Simple anæmia.—Symptoms.—The face is pale, sallow, and emaciated; the skin generally is pallid, waxy-looking, of a peculiar yellowish tinge, and often puffy and bloated about the eyelids and ankles, the superficial veins are prominent, the sclerotic bluish and clear. The mucous membrane of the mouth looks white and bloodless, the gums, lips, and tongue are pale and flabby, and the digestive and assimilative functions very much deranged. The digestion is very slow and painful, and is imperfectly performed. There is a sense of fulness and feeling of uneasiness, weight or heaviness, or the opposite, a feeling of sinking or emptiness after meals, and flatulent distension until the digestion is finished. In advanced cases the stomach is very irritable; there is nausea or retching, or eructation of half-digested food into the mouth. The bowels are usually confined, but attacks of diarrhœa are not unfrequent. The secretions are generally scanty. Hæmorrhages from the stomach and bowels sometimes occur. The pulse is small, quick, and feeble, and the extremities cold. There is languor, lassitude, and incapacity to work, faintness, breathlessness, and palpitation of the heart, and tendency to syncope. Neuralgic pains are common.

Physical signs.—No enlarged glands, no enlargement of the spleen can be detected. A systolic anæmic murmur best heard at the left base; a loud bellowing murmur and a thrill in the course of the subclavian arteries, and a venous humming or whistling sound (the *bruit-de-diable*) heard at the root of the neck, are physical signs believed to be due to the changed condition of the blood. The arteries in the neck beat violently.

If anæmia continues for a very long time, general atrophy of the secreting glands sets in, with diarrhœa or profuse sweating, or general anasarca, and now and then great dyspnœa. Painful spasms and even convulsions may occur. If death takes place it is by syncope or by coma.

CHLOROSIS.

Chlorosis, otherwise called green sickness, is a peculiar derangement, noticed in young and anæmic girls about puberty, and is due to some chemical change in the blood-pigments. The red corpuscles are pale, small, and diminished in number; the fibrine is unaltered in amount, and the serum is in excess. Disordered menstruation, leucorrhœa, and other sexual derangements, are common accompaniments. The nervous system, the circulatory, and the muscular systems also suffer.

Symptoms.—The patient has a yellowish, waxy, or greenish look, and a dark halo round the eyes. She suffers from headache, giddiness, and even from faintness. The pulse is small, frequent, and weak, and palpitation with cardiac murmur is common. The skin is œdematous, the mucous membrane of the mouth and conjunctiva is puffy and flabby; the tongue indented by the teeth; the gums spongy and pale. There is often a slight elevation of temperature, which no doubt gave rise to the old term for chlorosis, Febris Alba Virginum. The patient also suffers from pain under the lower ribs and from derangement of the stomach. The digestion is slow, painful, and imperfectly performed. After a meal there is a feeling of weight and uneasiness accompanied by flatulence. In chlorotic females, even though there may be no sickness, the gastric sensibility is so much increased and the muscular contractions of the stomach so irregular, that they often vomit their food within a short time after taking it. The symptoms are relieved by the vomiting. The bowels are usually constipated, the liver inactive, and the breath offensive. The urine is abundant and of low specific gravity. Many chlorotic females have a dislike for animal food, which seems to cause them pain and discomfort. They also suffer from acidity, heartburn, and pyrosis or water-brash. Chronic ulcer of the stomach is not uncommon in cases of chlorosis. Hysterical symptoms are of frequent occurrence.

PERNICIOUS ANÆMIA.

Is a morbid condition of the blood unconnected with any local or general disease. It is characterised by very severe symptoms, and has a fatal and rapid issue in a majority of cases, the duration varying from three or four months to a year. The disease is progressive, all the vital functions gradually become impaired, and death takes place by asthenia or syncope.

Causes.—It is more common in females than in males. Middle age is the most common period for its occurrence, though other periods are not exempt. Pregnancy, prolonged lactation, repeated miscarriages, insufficient food, want of attention to hygiene, and debilitating influences of all kinds are probable predisposing causes.

Symptoms.—These set in gradually and are grave from the first. The complexion becomes sallow and straw-coloured, or pale and death-like. The eyelids become œdematous, and in advanced cases there is anasarca of the legs and feet, and also puffiness of the back of the hands. The patient suffers from extreme exhaustion, and is unable to sit up long in bed. Fainting or giddiness follows any exertion or excitement. The pulse is generally frequent and small. The heart's action is very feeble, and anæmic systolic murmurs are heard at the left base, and a venous hum at the root of the neck on the right side when the neck is turned towards the left shoulder. Repeated attacks of hæmorrhage from the nose, mouth, and kidneys are common symptoms. Retinal ecchymoses are also observed. When the hæmorrhage takes place within the cranium, death is due to coma. In advanced cases there is effusion of fluid into the serous cavities. Death takes place from asthenia, often preceded by passive delirium, or coma, or from exhaustion (syncope) due to hæmorrhages. The patient often suffers from irregular attacks of fever, but the temperature seldom rises above 103°.

Diagnosis.—The disease presents certain features resembling those of leukæmia, but differs from the latter in several important particulars. Thus there is no enlargement of the spleen and lymphatic glands, and no increase in the proportion of white corpuscles.

Simple anæmia.—Treatment.—The patient should be restricted to a light nutritious diet of milk, soup, eggs, and easily digestible kinds of animal food. As a medicine, dialysed iron with small doses of arsenic has a marked effect in improving the condition. Under its use diarrhœa and headache disappear, the pulse improves, colour begins to appear on the face and on the mucous membranes, and the number of red corpuscles undergoes a marked increase. Should the anæmia be traceable to any particular cause, this latter must, if possible, be removed.

Chlorosis.—Treatment.—The most important point is to attend to hygienic conditions. Careful nursing, fresh air, good light, outdoor exercise, dry and bracing climate, sea-bathing, and early hours, are important. The food should be nutritious and simple. Wine, beer, milk, and broth, may be taken daily according to circumstances. Proper clothing and rest are very desirable. The various preparations of iron; the concentrated essence prepared from game birds, which is well-known in India; vegetable tonics; calf's-foot jelly; may all be continuously given with good effect. Regular and sufficient menstruation should be established, and the bowels must never be allowed to become loaded. In many cases of anæmia of young women, the costiveness can be best relieved by the use of Epsom salts with diluted sulphuric acid. A grain of quinine may be added to each dose.

Cold baths.—In anæmia due to leucorrhœa, spermatorrhœa, or other low nervous states, cold sponging or cold baths are very invigorating. Where patients are not in the habit of cold bathing, they should at first use tepid water, and gradually and daily reduce its temperature. The patient, if very weak, may have a glass of egg-mixture an hour before the bath, and about half an hour's repose in bed after thorough drying and rubbing.

Iron.—In anæmia or chlorosis. If the stomach is irritable and weak, iron in the shape of reduced iron, or the dialysed iron, or the carbonate is best suited. In some cases the tincture of the perchloride of iron produces far better results. Where the tongue is pale, flabby, and deeply indented by the teeth, large doses of the tincture are useful. Sometimes doses of three or four grains of the sulphate of iron may be substituted for the tincture. Pain and vomiting after food and tenderness on pressure over the epigastrium are best relieved by tincture of iron. The effect of iron in anæmia is to increase the number of red corpuscles. It also gives tone to the relaxed mucous membrane of the stomach and intestines, and thus tends to improve digestion.

Hygiene.—In every case of anæmia attention to diet and general regimen is an all-important part of the treatment. Where anæmia is consequent upon chronic diseases of the kidney or heart or due to cancer, the cachexia is not cured by iron, which, however, may be used as a palliative remedy.

Pernicious anæmia.—Treatment.—Very little can be done with any hope of cure. The disease generally ends fatally. As the condition of the patient's stomach is very unfavorable for the reception of food, rectal alimentation may be had resort to, with a view to prolong life. Dialysed iron with very small doses of strychnine may be given from time to time. The hæmorrhage which sometimes occurs needs prompt remedies for its cure. In extreme cases transfusion of blood has been tried.

LEUKÆMIA (LEUCOCYTHÆMIA).

Is a morbid state of the blood in which the white corpuscles are in excess, and the red corpuscles proportionately and absolutely diminished in number. Temporary increase in the number of white corpuscles takes place under several physiological and pathological conditions, *e.g.* during the early stages of digestion, in pregnancy, after loss of blood, and in inflammatory diseases. In leukæmia, however, the condition is permanent, the white corpuscles rapidly increase while the red corpuscles decrease. It is a disease of adult or advanced life. The spleen or the lymphatic glands, or both are enlarged. Some physiologists regard leukæmia as a change in the quality or constitution of the blood, akin to a suppurative process, and tending very rapidly to involve the lymphatic glands. The white corpuscles of the blood are regarded as a kind of secretion from the lymphatic glands. Any change in the structure of the latter, or anything which impairs their function, leads to impairment of the quality of the blood. Normal blood contains one white to about 335 red corpuscles. In leukæmia the proportion may be 1 : 6 or even 1 : 2.

The changes in the spleen and lymphatic glands consist chiefly in the overgrowth of lymphatic tissue, or increase of the cellular elements composing the spleen or contained in the meshes of the trabecular tissue of the lymphatics. All these cell-elements are found in the blood, and it would appear that the leukæmic tumours are due to the increased formation of cellular elements and not to their retention. The lymphatic glands rapidly increase in bulk, become gradually opaque, soften, and yield a milky juice.

The changes in the blood.—The specific gravity of normal blood is 1055. In leukæmia it is 1036 to 1045. The proportion of water in the serum is somewhat increased, and there is less iron. The leukæmic blood, freed from fibrin, looks pale from its containing a large number of white corpuscles ; the red corpuscles are few and always sink to the bottom. If the blood be shaken with ether it retains its white colour to a greater extent than when it contains only chyle-corpuscles. Under the microscope we find the whole field covered with white corpuscles, with here and there rows of red corpuscles. The amœboid movement of the white corpuscles is slight, or absent in advanced cases.

Causes.—It may depend on disease of the spleen and is then known as splenic leukæmia. When on disease of the lymphatics it is called lymphatic leukæmia. Leukæmia occurs more frequently in males than in females, and during the middle period of life. The true cause is very obscure. The disease has no connection with malaria, as some have supposed.

Anatomical appearances.—There are often pus-like coagula in the right cavities of the heart, and in the veins of the heart, cerebral membranes, and in small branches of the pulmonary artery. In the lymphatic variety the lymphatic glands form huge tumours; these involve the mesenteric, the bronchial, cervical, axillary, and inguinal glands. The enlarged glands are soft and pale, their surface smooth and watery looking, their cortical substance is especially swollen. The enlargement is due to the increased formation of cells, nuclei, and granules similar to those in the normal glands. The liver is generally enlarged owing to lymphatic formations. Distinct corpuscles are also sometimes found in the marrow of bones and in the suprarenal capsules. Leukæmic tumours have also been found in the kidneys, pleura, and intestinal mucous membrane.

Changes in the spleen.—The spleen is generally enlarged, its consistence is abnormally increased. The trabeculæ are thickened and form white striæ through the splenic pulp. The capsule is opaque and thickened. The cell elements become multiplied and find their way into the blood, thus increasing the number of colourless cells. The weight of the spleen may be increased from five ounces to nine pounds. Its vessels are enlarged and increased in number. In many cases old hæmorrhagic infarctions are found.

Three varieties of leukæmia have been described: In the first the spleen and lymphatics are enlarged (spleno-lymphatic leukæmia). 2. Spleen only enlarged (splenic leukæmia). 3. Lymphatics only (lymphatic leukæmia), a very rare form.

The lymphatic is distinguished from the splenic variety by the difference in the size of the leucocytes. In the former the white corpuscles are smaller than normal. In the splenic form the leucocytes are large, they more resemble the normal white corpuscles, and contain two or more nuclei. In the spleno-lymphatic variety both forms of leucocytes are found mixed in the blood.

Symptoms.—In the splenic form there is pallor of the face, extreme weakness, languor, and occasional headaches. Slight pain, or a sense of fulness, in the left hypochondrium soon begins to attract attention. The patient becomes emaciated and complains of swelling of the abdomen, and shortness of breath on the slightest exertion. This last symptom is owing to the pressure of the enlarged bronchial glands upon the bronchi, leading to disordered respiration or dyspnœa, or the dyspnœa may be due to pressure of the enlarged spleen upon the diaphragm. In a majority of cases, there are slight febrile paroxysms towards evenings. The patient also suffers from palpitation of the heart, and from repeated attacks of epistaxis or other hæmorrhages. The pressure of enlarged glands on venous trunks may cause dropsy. As the case progresses the abdomen becomes much swollen, heavy, and solid, owing to the enlargement of the spleen. The enlargement may be to such an extent that the spleen occupies one half or more of the left side of the abdomen, and reaches to the spine behind and to the crest of the ilium below. The appetite is lost or impaired. The bowels are constipated, or if the intestinal glands are involved in the disease, there is exhausting diarrhœa. In advanced cases the general debility rapidly increases, the pulse continues frequent, above 100, and there are night sweats; the patient becomes very much emaciated; there is œdema of the feet and ankles, and effusion of fluid into the serous cavities. The urine is abundant, generally acid and loaded with urates. The proportion of uric acid is increased. The urea is also increased. Mucous râles are heard all over the chest, and there is often a soft systolic murmur at the base of the heart. The pulse is always very frequent, and the temperature above normal. Towards the end other complications occur, as diseases of the pleura or lungs, and boils and carbuncles become developed. Death takes place from asthenia, often preceded by delirium, stupor, or coma ; or from exhaustion due to hæmorrhages, or from obstruction in the bronchi, or from diarrhœa.

The course of the disease varies; if the hæmorrhagic diathesis does not complicate the case, the patient may live for years. The usual duration from the first development of the symptoms is from six to eighteen months.

In the lymphatic form the disease commences with enlargement of glands in the neck, axilla, groins, or various other parts of the body, and marked anæmia soon follows. The patient is pale and cachectic in appearance. The enlargement of the glands goes on slowly but steadily with or without pain or fever.

Enlargement of the spleen and of the lymphatic glands also occurs without leukæmia. Thus in malarious fevers enlargement of the spleen is common. Similar enlargement of the lymphatic glands is noticed in syphilis, scrofula, and Hodgkin's disease. In none of these affections, however, are the white corpuscles increased as in leukæmia.

Treatment.—The blood should be examined carefully in order to confirm the diagnosis. The nature of the disease having been ascertained, we may proceed to adopt such measures as are likely to improve the health and prolong life. Quinine, iron and iodine, in their various preparations, may be given either alone or combined. Tonics, good food, and blood restoratives may prolong life for a considerable time. In a few cases transfusion has been tried. Phosphorus is a reputed remedy, and has been given with benefit. All those remedies which diminish the size of the spleen, as ergotine in five-grain doses hypodermically, and iodide of potassium internally, have been tried with some relief. The complications as they arise must be treated on general principles.

DIABETES.

There are two forms of this affection, known respectively as Diabetes mellitus and Diabetes insipidus. In both these disorders there is an increased quantity of urine secreted (polyuria).

Diabetes mellitus (*Glycosuria*), otherwise known as honeyed or sweet urine. This disorder is characterised by the presence of sugar in the urine. It is a chronic disease of which the local cause is as yet undetermined. Pathologically considered, in this affection there is more sugar than normal in the blood, and hence the term glycohæmia might be appropriately used to designate it. The condition does not depend upon any disease, functional or otherwise, of the kidneys. The urine persistently contains sugar, and a very large quantity is passed every day. Great thirst, pallid skin, insatiable appetite, wasting, and other grave constitutional symptoms, with a variety of complications, accompany this abnormal secretion.

Causes.—Diabetes may occur at almost any age. It is particularly rapid in the young, may sometimes be checked in middle life, owing to the association of a gouty condition. In such cases the presence of glucose is found to alternate with that of uric acid. It is not often fatal, though of common occurrence, after sixty. The cause is generally obscure, but that it has some relation in many cases to continued mental anxiety is probable. In others it seems an alternative of a phthisical diathesis.

Pathology.—During health amylaceous food is converted into sugar, and an amyloid substance, called glycogen, or hepatic dextrine or starch, is formed in the liver, and this being acted upon by a peculiar ferment, already existing in the blood, becomes converted into sugar. During health sugar so produced passes into the hepatic vein and through the inferior vena cava into the system, where it is consumed. Diabetes results when there is insufficient degree of transformation of the sugar in the blood. The sugar-forming theory has been of late disputed, and it is maintained that the liver is a sugar-assimilating organ, that in diabetes an unduly large quantity of sugar, sufficient to render the urine highly saccharine, enters the blood from the liver. Thus, in diabetes we have either an increased production of sugar or the diminished destruction of the quantity normally produced. In the absence of visible changes in the kidneys or elsewhere, the floor of the fourth ventricle and the cervical ganglia of the sympathetic have been considered the true seat of the lesion in diabetes.

Post-mortem appearances.—There are no constant post-mortem appearances except those of the wasting and the complications.

Symptoms.—The disease often escapes notice for a very long time. Sometimes the attention is drawn to its existence by the attendant pruritus of the skin of the genitals. The itching is often associated with impairment or loss of sexual power. Generally the increase in the quantity of urine, and particularly in the number of times he is obliged to void it, is the first symptom noticed by a patient with diabetes. He is obliged to get up at night several times to empty his bladder. Such frequent micturition might be due to mere cold or to an enlarged prostate. But the results of the examination and the detection of the characteristic sugar in the urine establish the diagnosis. Diabetic urine is of a pale straw colour, of a sweet taste, and of a faint apple-like odour. Its quantity varies from eight to thirty pints in twenty-four hours. Its specific gravity is increased and ranges from 1030 to 1060, owing to the presence of sugar and excess of urea, but may be less if albumen be present. It is generally of an irritating nature, and consequently often causes heat and burning along the urethra. It does not undergo putrefaction even when kept for a long time. When kept in a warm place it ferments rapidly, deposits a sediment, and exhibits quantities of fungi or torulæ.

Methods of testing for sugar have already been given in the chapter on the Symptomatology of Disorders of the Urinary System. A trace of sugar is often found in the urine of healthy persons. It may be present for a short time in cerebral injuries, in nervous disturbances, as meningitis, tumours of the brain, epilepsy, chorea, tetanus. It is often met with in chronic bronchitis, and in other affections which interfere with the respiratory functions; during the inhalation of chloroform and ether; in gout and carbuncle; as an effect of poisons, as of bichloride of mercury; as a result of ingestion of food containing large quantities of sugar or starch.

Sugar may be present without any other symptom characteristic of diabetes mellitus. On the other hand, cases occur in which diabetes mellitus may be existing, and still for a time no sugar is found in the urine. Thus sugar may disappear during fevers, and other intercurrent diseases.

The chief symptoms which accompany this excessive discharge of abnormal urine are the following:

The skin is harsh, scurfy, and dry, the countenance distressed and worn out, the muscular weakness, associated with general wasting of all the tissues, gradually increases and there is loss of sexual power, with pruritus of the prepuce or vulva. As the case progresses we find cold extremities, hectic towards evening; sometimes the temperature is markedly reduced, and there is shrinking of the frame, rapid diminution in the weight, feeling of uneasiness, and indisposition to work. The appetite is enormous, but the digestion becomes deranged; the mouth is foul and dry; gums red, tender, and swollen; tongue peculiarly red and irritable, or clean and cracked, and dry, sometimes moist and furred. The breath is of a sweet and fragrant odour, and there are dyspeptic symptoms, with fulness at the epigastrium, flatulence, gaseous and acid eructations.

The formation of cataract and dimness of vision sometimes occur at an advanced stage. The disease is often slow and insidious in its progress, or may end in about two years. The younger the patient the more rapid is its progress. It is said that the cause of the cataracts, which are always soft, is that the sugar is imbibed by the crystalline lens.

Prognosis.—In this disease recovery is rare, but in a majority of cases with attention to diet and regimen, retrogression of the symptoms, even to an extent simulating recovery, may be expected. Patients with this disease are more susceptible to intercurrent disorders, and are less able to resist their influences than others. As a rule relapses occur sooner or later, the length of time varying with the previous health of the patient. The younger the patient the less is the chance of recovery. Recovery may occur if the patient inherits gout, if he is over forty, and is inclined to obesity, and if there are no complications. The chances of recovery are in some degree favourable if the lungs are sound, the urine without albumen, the teeth healthy, the skin moist, and if the effects of treatment and diet are seen in a marked diminution in the quantity and specific gravity of the urine, in increase in weight and strength of the body, and in diminished thirst and appetite; if the muscular power is regained and there is less fatigue after exertion. Old people often have some degree of diabetes for years. A sudden cessation of the excretion of sugar indicates the near approach of death. When rapid wasting, impaired muscular power, diarrhœa, mental irritability, and other brain-symptoms are present, patients are liable to sink suddenly. In all young people, and at all ages when pneumonia, phthisis, gangrene of the limbs and general dropsy are likely complications, the prognosis is very unfavorable.

Complications.—Albuminuria is a very frequent complication, and often leads to uræmic symptoms. In these cases Bright's disease is always present. In rare cases the disease runs a very rapid course. Diabetes mellitus is often associated with pulmonary consumption. Boils and carbuncles, and cataracts are common accompaniments. Œdema of the feet without albuminuria occurs, as in all cases of extreme debility.

Treatment.—Regulation of the diet is the most important point; all food containing starch and sugar must be forbidden. The employment of drugs is of less avail. The healthy assimilation and nutrition should be promoted by a diet suitable to the powers of the organs of digestion. Animal food, as meat and poultry, is highly beneficial. These may be given, boiled or roasted, and either in the form of a soup or minced. Fish may be taken freely. Coffee and tea may be dispensed with, or if given should be mixed with a little glycerine instead of lumps of sugar. Lemons may be taken, the juice, freely diluted, serves to allay the thirst. Almonds, cocoanuts, &c., are also useful. Gluten, or bran cakes and biscuits, almond biscuits, and eggs, are admissible; as also are many vegetables, such as cabbage, cauliflower, celery, and mustard. Milk and lime-water, or diluted phosphoric acid, are good drinks. Cream-skimmed milk, cheese or butter, can be given in any quantity, as the sugar in the milk does not undergo glucose transformation. In every case the diet should be such as to meet the requirements of the digestive system, and also to satisfy the patient's palate. Alcohol free from sugar, as contained in dry sherry, brandy, claret or whisky, may be used in strict moderation. Sugar in the natural form, as met with in manna, and in such fruits as oranges, grapes, plantains, may be taken with impunity.

Food containing starch, as bread, vermicelli, rice, oats, porridge, &c., should be avoided. Potatoes, arrowroot, tapioca, and sago are injurious. Peas and beans, carrots and turnips, and beetroots are vegetables which, when taken, increase the quantity of sugar in the urine in a few hours. The sparkling wines and malt liquor of all kinds are equally unsuitable for diabetic patients.

The strict observance of such anti-diabetic diet is necessary, and may be continued until the amount of sugar in the urine is lessened, and other improvements, as regards nutrition, strength, &c., become well marked. Should the patient's general health be not improved, the diet may be modified. In every case, if after a long course of such treatment the amount of sugar is markedly diminished or has disappeared, and the quantity of urine passed every day has become normal, the patient may be allowed other articles containing starch and sugar, their use being regulated according to the effects produced on the urine, which must be tested from day to day for some time.

As adjuncts to the dietetic treatment, warm clothing, warm baths, sea-baths, and change to the seaside are most useful. Opium, alkaline carbonates, arsenic, iodine, bromide of potassium, have been tried, and most of them with indifferent success. Opium does certainly diminish for a time the quantity of sugar in most cases. Its tendency to increase the constipation which usually exists ought to be counteracted by purgatives. The effect of the drugs upon the system generally should also be watched, and the digestion must be carefully attended to. For sleeplessness sedatives, such as codeia and hyoscyamus, are useful.

Salicylic acid, in fifteen-grain doses every four hours, has been used with good effect in the treatment of diabetes. It is supposed to enter into chemical combination with the *materies morbi* or glucose. It is said that in several cases under its use the quantity and specific gravity of the urine became diminished, the patients gained several pounds in weight, and the sugar became less in amount or disappeared altogether. Oxygen is another remedy said to possess remedial powers over some forms of diabetes. Demarquay (as cited by Dr. Ringer) states that by means of this agent he has reduced the sugar in the urine by one half, the diet remaining unchanged.

Diabetes insipidus.—This condition (polyuria) often occurs in the course of hysteria and other nervous disorders, its existence being only temporary. True diabetes insipidus consists of a persistent increase in the quantity of urine with a low specific gravity of 1005 to 1010, without any renal disease, the secretion being free from renal casts and albumen.

Symptoms.—Those most marked and characteristic are great and unquenchable thirst and increased quantity of urine. The patient is constantly disturbed by calls to pass water. The disease is often associated with cerebral disorders; it has been known to supervene after blows on the head, exposure to great cold, and violent muscular exertion. In a few cases the disease is temporary and complete recovery ensues within a few weeks.

Pathology.—The disorder is supposed to be the result of abnormal dilatation of the renal capillaries. This condition allows increased transudation of watery constituents and polyuria follows. Dr.

Roberts remarks that the initial disorder in diabetes insipidus must be looked for elsewhere than in the kidneys.

Treatment.—The main treatment consists in adopting such measures as are likely to facilitate the contraction of the renal vessels. The extract of ergot in ʒj doses given every four hours has been tried with good results. Some recommend gallic acid, others valerianate of zinc or valerianate of ammonia. The constant current to the spinal column and over the kidneys may be tried. The general symptoms and various complications may be treated on general principles.

Scurvy.

Scurvy is a chronic affection common in seafaring people, and said to be due to long-continued deprivation of fresh succulent vegetables or fruits; severe cold, over-fatigue, and exposure to the injurious influence of malarious districts, seem to favour its development. It is characterised by sponginess of the gums, and the occurrence of livid hard patches under the skin of considerable extent; these patches are harder to the touch than the surrounding skin. It has been observed in a modified form among sempstresses and other people whose earnings are small, and whose diet consists chiefly of bread and tea. To this variety the term land-scurvy has been applied.

Causes.—The actual cause of scurvy is unknown, all that can be said is that scurvy is a disease dependent upon a derangement in the composition of the blood.

Symptoms.—The disease is preceded by languor and depression of spirits, and these symptoms may continue for weeks before the true character of the disease becomes manifest. Various other symptoms are general debility, pallor, and pain in the limbs or joints; there is great longing for fresh vegetables and fruits. When the disease becomes established the skin generally, or the face and eyelids in particular, assume a dusky hue; the orbit appears small and dusky. There is congestion or inflammation of the mucous membrane of the mouth. The edges of the gums are purple where they are in contact with the teeth; the gums become swollen, spongy, and livid. The teeth become loose in their sockets, and are often concealed by the swollen gums, portions of which become detached, leaving ulcers. The breath is highly offensive. Hæmorrhage from these mucous surfaces is apt to occur, either spontaneously or on any slight pressure on the gums. Palpitation of the heart and dyspnœa may be present. Petechial spots appear on the legs, and extravasations of blood beneath the skin, and between the muscles of the legs and thighs, form hard and swollen masses of fibrinous deposit. The swellings are painful, livid, and often prone to ulceration; the epidermis feels dry and raised to the touch. Hæmorrhages from other mucous surfaces are common. The bowels are usually constipated at the commencement, but diarrhœa and even dysentery often come on. In advanced cases œdema of the feet and ankles or dropsy may occur. Death is due to thrombosis, or to general exhaustion, or to syncope the result of extreme prostration from hæmorrhages. Whole ships' crews have died of scurvy, and the disease is sure to end in death if proper articles of diet be not procured.

Diagnosis.—Scurvy may be mistaken for purpura hæmorrhagica. Extravasation into the skin and mucous membrane is common in both, but purpura is unaccompanied by any affection of the mouth, and there is no peculiar subcutaneous or intermuscular infiltration, nor any hæmorrhagic inflammation of serous membranes. Thus the lower limbs are not swollen nor painful.

Treatment.—Vinegar or limejuice regularly administered tends to prevent the onset of scurvy where fresh vegetables cannot be obtained. A diet of fresh vegetables and fresh meat in some form is essential for cure.

As the gums are spongy solid food may at first be avoided, and liquid food in a concentrated form may be given from time to time. By way of drugs, tonics as cinchona, calumba, or gentian, with chlorate of potash, and small doses of strychnine, are very serviceable. If the gums are ulcerated, touching with caustic or astringent washes are indicated. Hæmorrhages from the gums, nose, or the stomach and bowels need astringents, either internally or locally, as the case may be. Besides diet and medicine, hygiene and sanitation are all important aids in the cure or relief of scurvy. Potash salts are very useful in these cases and they should be perseveringly given for a long period.

Beriberi.

Closely allied to scurvy is an affection known as beriberi. Beriberi is a constitutional disease, the etiology of which is but little known. It is met with chiefly in the tropics, and is endemic in some portions of Hindostan. The disease is characterised by marked anæmia, and accompanied by stiffness or numbness of the lower extremities, which in rare cases become paralysed. The face is swollen and bloated, and there is dyspnœa on the slightest exertion; œdema is well marked. The connective tissue of the muscles is bathed in fluid. In fully developed cases, besides marked anæmia, the patient suffers from great dyspnœa, from oppression at the epigastrium, inability to walk, and vomiting of blood. The hands and feet are generally cold and clammy. The urine is scanty, high coloured, and often suppressed. The pulse is frequent and small, or intermitting, weak, and fluttering. There is palpitation of the heart. An anæmic bruit is often heard in the neck.

Duration.—It varies from several days to a few weeks. Death occurs from embolism or from effusion into the serous cavities.

Prevalence.—Cases are often met with in Bombay, and are more numerous among the Mussulmen class of natives than the Hindoos, as the disease is more common and generally fatal among the people who inhabit the Malabar coast, but recoveries are somewhat more numerous among the natives of India than among foreigners. The disease rapidly develops among the natives and especially in those who are very badly fed. The influence of season has much to do with its development. Damp and variable climate and moisture assist greatly in its production.

Post-mortem appearances.—These are serous effusions in various parts of the body. The pericardium is filled with fluid and the lung is œdematous. There is fluid over the surface of the brain. The spinal cord is found to contain fluid in its substance either as a result of effusion or of congestion of its vessels. The liver, spleen and kidneys are enlarged and softened.

Prognosis.—Cases of beriberi rarely recover. Death is due to embolism or cardiac complication.

Treatment.—Stimulants, generous diet, and tonics are the main remedies. If the stomach cannot retain food give it by the rectum. As the limbs are cold and clammy rub the extremities with powdered ginger or stimulating liniments, and wrap them up in flannel. For dyspnœa and palpitation give digitalis. Extract of nux vomica, given in $\frac{1}{4}$ to $\frac{1}{3}$ of a grain is often useful in subduing dropsy. For the same purpose drastic purgatives, as extract of elaterium and diuretics, are also serviceable. Elaterium may be given till copious watery evacuations are produced, and may be repeated twice or thrice a week.

The celebrated Theriaca Andromachi, or treak faraak, is useful in subduing the œdema of this as of other diseases. Opium is one of the ingredients. It also contains common germander. The extract is very largely used by the native doctors in India. Under its use the patient passes four or five stools daily without undue weakness being produced. The vapour or hot-air bath is also useful in promoting the action of the skin.

ERYSIPELAS.

Erysipelas.—The disease is often named *Rose* and *St. Anthony's fire.* It is an intense hyperæmia or inflammation of the cutis, accompanied by profuse serous transudation into the subcutaneous areolar tissue. The disease is characterised by diffuse inflammation of the skin and fever. It is sometimes complicated with inflammation of the brain or meninges, of the lungs, bronchi, and alimentary canal. As a local manifestation it has a tendency to spread rapidly over an extensive area from a small portion of the skin. The disease may also affect the mucous and serous surfaces, the lining membrane of arteries, veins, and lymphatics, and the connective tissue. The orbit, scalp, and skin of the face are the most common sites. It often spreads to the fauces, pharynx, and larynx by continuity or by metastasis. In the case of the pharynx the erysipelas is highly contagious. The laryngeal implication is dangerous as it leads to œdema of the glottis. The extension of the disease from the skin to the subjacent organs, as the serous and mucous surfaces, is best seen after surgical operations and in erysipelas of the face. Similar extension to the peritoneum takes place after operations for hernia and injuries of the pelvis. In erysipelas the lymphatic vessels, glands, and veins are implicated. There are often small hæmorrhages into the skin.

Pathology.—Erysipelas is due to the presence of some poison in the blood. Locally the poison at first affects the walls of the lymphatics or the absorbent system, and then spreads into the surrounding tissue. Its effects are manifested by diffuse inflammation of the skin. It may be due to extension of inflammation from the walls of the lymphatic vessels into the surrounding skin; to inoculation of some acrid or venomous material; to absorption of ichorous secretion of a wound; or to exanthematic causes. Many diseases, in which debility is a prominent symptom, as renal dropsy, typhus fever, &c., predispose to it. It is occasionally met with in new-born children, but is most common in adults between twenty-five and forty. The surgical forms are most communicable and contagious. It also spreads by fomites. It is more apt to occur in warm weather than in cold; in the poor and in those who indulge in excesses, than in the rich and sober. A previous attack predisposes to it. It is sometimes epidemic. Some believe that the disease is not a specific fever but a local manifestation, in the same sense as inflammation of the lung is; that, like other inflammations, it recurs any number of times, and that it is also contagious like catarrh and ophthalmia. Others are of opinion that it is a specific fever, and maintain that the existence of a short stage of incubation, the presence of enlarged and tender lymphatic glands before eruption appears, the existence of bacteria in the lymphatic glands and other inflamed tissues, its capability of inoculation in other animals, and the resemblance of its symptoms to those of specific fevers, show that it is so. Erysipelas may be simple and affect the skin alone, or phlegmonous, and affect the skin and extend deeper into the subcutaneous tissues. It also extends to the serous and mucous surfaces, and to the connective tissue, *e.g.* in the orbit and scalp. The gangrenous form is rare, and occurs only in persons much debilitated and cachectic. When the poison acts on the skin we find diffuse inflammation of the cutis, and the affected part presents a circumscribed blush of vivid redness, of a rose colour, which fades on pressure; the cutis and subcutaneous tissue contain lymph-exudation and corpuscles. The patch soon becomes thick, hard, and brawny, and its margins are well defined. In some cases inflammation involves the lymphatic vessels, and we find tender and red lines extending to the neighbouring lymphatic glands, which are also inflamed and painful, and sometimes suppurate. The patches coalesce, and thus increase their area, and in some cases they occupy the whole body. Occasionally erysipelas assumes an erratic form. Thus, it disappears from one part and appears in another. This is most commonly seen in persons with gout or rheumatism.

Symptoms.—They are those of local inflammation of the affected part, of inflammatory fever, and of intercurrent inflammatory lesions. All these symptoms appear in various degrees of intensity. In acute cases the symptoms come on suddenly, and there may be fever accompanying an erysipelatous patch or there may be indisposition for a few hours following the exposure to infection. The period of latency varies from a few hours to fifteen days. In others there are rigors, flushed face, irregular and quick pulse, loaded tongue, and irregular condition of the stomach and bowels, followed by the appearance of an erysipelatous patch on some part of the face, and sore throat; the latter is a frequent accompaniment. All these symptoms are attended with prostration. In some cases the patch appears on the second or the third day after the attack. In erysipelas of the face the disease often begins as a circumscribed red spot on one side of the nose, and gradually extends and covers the scalp, neck, and shoulders. It is also accompanied by pain and tenderness. The eyelids are swollen and puffy, and there is burning pain and itching. All trace of natural features may be lost. The neighbouring lymphatic glands are enlarged and swollen. In cases due to injury the erysipelas is most intense near the edges of the wound.

In erysipelas the temperature rises very rapidly, and remains high, 104° to 107°, with slight morning remissions as long as the inflammation lasts. It may remain high for twelve or fourteen days. The period of defervescence is commonly short, and is often completed in from twelve to twenty-four hours.

Erysipelas sometimes invades the whole face, scalp, or both lower and upper limbs. The face, eyes, ears, hairy scalp, and part of the throat are usually attacked, but rarely the back of the neck or trunk. In the case of the scalp, the hairs usually come out, but there is no permanent injury to the hair follicles, hence the baldness is soon repaired. Where vesication takes place the skin is swollen and blebs form. These swellings then subside, the pain abates, the blebs dry up, or the cuticle gives way, leaving a crust, which then falls off, the subjacent skin appearing of the normal hue and texture. Sometimes superficial ulcers are left behind.

The inflammation of the skin usually ends in resolution, and recovery results. In such cases the redness disappears in three or four days. At first it changes to a deeper hue, the effusion becomes absorbed, desquamation takes place, and the skin becomes of a natural colour. In unfavorable cases the eruption is of a dark red colour, and dark vesicles and bullæ are formed. In some cases suppuration or sloughing and gangrene occur. Fever increases towards evenings. The temperature rises from 99° to 105°. Pulse is 120. The tongue is furred and there is stomatitis, and also glossitis. In such cases the urine is generally scanty and contains albumen, the urea is increased and chlorides diminished. There is delirium with nausea, vomiting, and diarrhœa, and low typhoid symptoms, often ending in death by exhaustion or coma.

Gangrene occurs only in surgical cases. The skin then becomes dark, its texture is destroyed, and blebs are formed containing dark fluid. Portions of the eyelids and of the scrotum are sometimes thus destroyed.

Erysipelas of the scalp, occurring in the aged, often shows all signs of improvement, when suddenly it extends to the meninges of the brain and ends in death. In cases of extension to the fauces death is sometimes due to œdema of the glottis. In persons of dissipated habits it is most dangerous. It is also dangerous in old people.

Complications.—Bronchial or intestinal catarrh, and hyperæmia of the kidneys. *Erysipelas neonatorum* is very fatal. It is due to epidemic influences, and is especially liable to occur during an epidemic of puerperal fever. It generally begins at the navel, which becomes red, hard, and shining. The child cries, is restless, and sleepless.

Diagnosis.—From scarlet fever, measles, and erythema. In *scarlet fever* the redness is localised, and is preceded or accompanied by sore throat. In *measles* there are nasal and catarrhal symptoms; there is no inflammation of deeper parts, and no implication of glands. *Erythema* does not affect the face or head, it does not spread quickly, and there are no vesications.

Prognosis.—It is dangerous if the disease spreads extensively, and also into the areolar tissue. In elderly people suffering from erysipelas of the face the prognosis should be very guarded. The coexistence of any form of renal disease much increases the danger. Œdema of the glottis is another contingency which must be borne in mind. In drunkards and debilitated people attacks of erysipelas are very apt to be attended with serious consequences. Fatal prostration is likely to supervene. In young children the complaint is a very dangerous one.

Treatment.—The disease is of a depressing nature, occurs mainly in old persons of debilitated constitution, and in those who indulge in excesses and dissipation. It is also epidemic, and is sometimes associated with renal disease. In all these cases lowering measures are strongly contraindicated. When the disease occurs in the young, in persons who are in robust and vigorous health, lowering treatment may be prescribed. Rest and free ventilation are necessary. The part should be dusted over with violet or rice powder, or covered with cotton wool or with collodion. If tension of the skin be great numerous small punctures may be made with the point of a lancet. Some recommend the application to the affected skin of a solution of nitrate of silver (one scruple to an ounce). Others notice the line of demarcation and paint the adjoining healthy skin with caustic to prevent any further spread of the disease. Sulphite of soda solution (ten grains to one ounce) may be substituted for the caustic. The chief aim of local treatment is to subdue the inflammation, mitigate the pain and suffering, and prevent extension of the mischief to the internal organs. The patient should have nourishing diet and cooling drinks. Preparations of iron, as either the tincture of the perchloride or the phosphate, may be given every four hours. Laxatives are needful in mild and simple cases. Gregory's powder may be given from time to time. The biliousness and vomiting may be thus checked. As a purgative calomel is highly recommended. If the fever is very high antipyretics may be given with digitalis, or the tincture of aconite or veratria may be combined with Spiritus Ether. Nitrosi, until the temperature falls or diaphoresis is produced. During the remission quinine may be given with benefit. In cases where symptoms of nervous depression come on opium is the best remedy. In asthenic cases with typhoid symptoms, wine and the free use of ammonia and camphor are indicated. The treatment by nitric acid is also recommended for these cases.

PYÆMIA.

Pyæmia, ichorrhæmia, or septicæmia is a collective name for many diseased processes. It indicates a morbid state of the blood and of the general system leading to febrile affection, and the condition is due to the absorption of some animal putrid poison in the blood. The blood is altered throughout the whole system. The poison cannot be isolated, though by inoculation it produces the same disease. When the disease leads to febrile disturbance without any characteristic local lesions it is known as septicæmia, but when as a further consequence it leads to the formation of secondary abscesses, either in the viscera or in other parts of the body, it is called pyæmia. The viscera chiefly affected are, the lungs, liver, spleen, and kidneys. The blood-poisoning shows itself soon after injury or parturition; sometimes there is a very high fever temperature from the first, and the blood is so deeply saturated with the poison that death occurs before any of the local symptoms manifest themselves.

As a general rule, the inflammatory processes are prolonged, and the fever temperature is not so high. Sometimes the poison acts either upon the liver or upon the intestines, and gives rise to the excretion of large quantities of dark bile, or to severe diarrhœa or dysentery. In other cases the poison affects the serous membranes, as the pleura, pericardium, or peritoneum. It may also affect the skin, and thus give rise to carbuncles, boils, and erysipelas.

Very often in specific fevers, as scarlatina or in diseased conditions of blood from other causes, we notice the formation of several small abscesses in different parts, and chiefly in the subcutaneous connective tissue. The natives of India often suffer from abscesses over the scalp, chest, abdomen, and on the arms or legs. When numerous, these abscesses are associated with slight fever. Similarly in some cachectic persons the least scratch or abrasion leads to a suppurative condition of the surface and causes a sore difficult to heal.

Causes.—Pyæmia is generally due to some injury or wound, which assumes an unhealthy action, and thus leads to the introduction of putrid matter into the blood. It may be the sequel of suppurative inflammation of bone or of childbirth. Its cause is often obscure, but a minute search will always reveal a source of poison. Abscesses of the internal ear are often its origin in children.

Pathology.—Pyæmia being always characterised by a tendency to suppuration has been regarded by some as a suppurative fever. Some poisonous material gains access to the blood, upon which it acts as a ferment, and capillary stagnation is the result. The feverish condition is supposed to be due to the fermentation of the blood, and the stagnation of blood in the capillaries leads to the formation of the secondary deposits. The primary stages of these deposits are known as thrombosis; the thrombi are the seat of inflammation and suppuration. The secondary abscesses are of embolic origin. A thrombus becomes broken up, and plugs are formed, which are carried away by the circulation, and, becoming arrested at various points, give rise to secondary suppurative processes in various organs. Nothing can be definitely stated with regard to the part played by bacteria in the production of pyæmia, but such low organisms are invariably present in liquids which are capable, when inoculated, of inducing pyæmic processes.

Post-mortem appearances.—The body decomposes very rapidly after death, so that in a few hours there is noticed lividity of the skin, dark lines along the superficial veins, and lividity of the lower part of the abdomen. In cases of septicæmia there may be no distinct local lesions, but the blood is fluid, and the spleen generally swollen. Diffuse sero-purulent inflammation of synovial and the large serous cavities, and catarrhal changes of the gastro-intestinal mucous membrane are also found in pyæmic cases. Metastatic abscesses and suppuration of the joints are the characteristic post-mortem evidences of pyæmia.

Symptoms.—These usually set in within a period varying from three to seven days from the date of injury. In acute cases the disease sets in suddenly with a severe rigor, or with convulsions, followed by great heat of the skin, frequent pulse, and copious sweats. There is a sudden rise of temperature, from 98° to 105°, on the first day of the attack. The countenance is very anxious, and the face is pale and flushed alternately, and low nervous symptoms show themselves. There is great prostration of the body and mind with extreme restlessness both by day and night, the patient often predicting the coming fatal termination. The features look haggard, pinched, and careworn, and the eyes lose their normal lustre. The conjunctivæ appear hazy and dusky. There may be vomiting and diarrhœa. A peculiar hay-like odour is perceptible in the breath and all over the body. The abdomen is very often swollen, and there are severe pains in different parts, especially in the joints. The breathing is hurried and often laborious. The urine is high-coloured, scanty, and contains but small quantities of chlorides. With these conditions typhoid symptoms also set in rapidly, and thus the case may be mistaken for one of typhoid fever.

The disease may assume a chronic form, repeated crops of abscesses appearing. In such cases death from exhaustion is the usual result, but recovery may occur if the important internal organs escape.

Where the disease lasts for a few days the body becomes consumed by fever and wastes. In pyæmia the rise of temperature is often sudden, and with the rise or preceding it rigors occur. The temperature generally remains high for a short time and then subsides, and is followed by profuse perspiration. This state is often repeated two or three times in twenty-four hours without any regular rhythm. In a majority of cases there is a sudden fall, the temperature is often considerably lowered in a few hours. It seldom gets below 100° or 101°. Such rapid rise and fall are characteristic of pyæmia. The fever generally exacerbates towards evening. During the day it assumes an intermittent form, so that there are frequent intermittent elevations of temperature.

The *prognosis* is unfavorable. The disease is particularly dreaded in the practice of obstetricians and surgeons, and especially after parturition and surgical operations. The danger is greatest when the fever is very high, the rigors frequent, the perspiration extreme, and exhaustion rapid. If the disease occurs in the young, lasts for many days, and the strength is fairly maintained, the chances of recovery are greater.

Treatment.—The treatment consists in general hygienic regulations and in stimulation, which should, as far as possible, be that of highly nutritious diet. To place the patient in the open air has been shown to give him the best chance of recovery. All abscesses within reach should, of course, be opened and dead bone removed. The use of disinfectants in surgical cases, and free ventilation in every case, are especially needed. Urgent symptoms must be subdued. Thus, if the fever is high reduce the heat by the cold sheet externally, or by giving aconite and quinine internally. During the intermission quinine may be given or injected hypodermically. The strength should be supported by liquid nutritious diet of milk, eggs, beef tea, &c., given repeatedly and in small quantities. Rectal alimentation may be tried if the patient cannot retain food. Alcoholic stimulants must be given, and carbonate of ammonia is very useful. The pain and restlessness must be combated by the free use of opium. In puerperal cases injections of Condy's fluid or of carbolic-acid lotion, or chloralum, are likely to be beneficial.

URÆMIA.

Retention of urea in the blood occurs, and is due to the failure of the excretory functions of the kidneys, urea not being eliminated. During health the quantity of urea excreted in twenty-four hours weighs about one ounce, or 493 grains, that of uric acid being only from four to eight grains. This quantity varies with habits, exercise, food, and age. Thus it increases in the prime of life, but is less in the young and in old age. The quantity is increased on muscular exertion, and after free use of animal food. In diabetes and in acute inflammatory and febrile diseases, in which there is rapid disintegration of the albumenoids, the products of tissue metamorphosis pass out as urea. Arsenic and alcohol are said to diminish it. It is also diminished after fasting. During convalescence from acute disorders, most of the nitrogen of the food being appropriated to the repair of the tissues, the quantity of urea falls considerably below the average. It is also diminished in chronic diseases, in cases where the nutrition is interfered with, in some convulsive diseases, in various fatal diseases, especially towards their close, and in acute and chronic Bright's disease.

Pathology.—Urea is supposed to be formed mainly in the liver, and its amount is influenced by the condition of the hepatic cells and by the activity of the hepatic circulation. It has been demonstrated clearly that in hepatic diseases which involve destruction of the hepatic secreting structure, the function of urea-formation is more or less in abeyance. Thus, in hepatic abscess, jaundice, and in cases of obstruction from gall-stone, and in cirrhosis, the quantity is extremely small.

There are three theories with regard to uræmic poisoning:—1. Urea is formed in the liver, but instead of being excreted by the kidneys it is retained in the blood, is decomposed, and converted into carbonate of ammonia which is supposed to be the essential excitant of the uræmic symptoms. 2. Some believe that urea after being secreted by the liver, is vicariously excreted by the intestinal mucous membrane, is converted into carbonate of ammonia, which is then absorbed into the blood. 3. The products of tissue metamorphosis, *e.g.* creatine, creatinine, leucine, tyrosine, &c., are not converted, as they ordinarily are, by the liver into urea, but being retained in the blood they are supposed to produce peculiar symptoms.

Causes.—Structural disease or extreme congestion of the kidneys are its causes.

Symptoms.—These are indicative of mischief in the brain, lungs, stomach and intestines. For convenience of description they may be divided into two main groups:—Firstly, those symptoms which are manifestations of the existence of the poison, and those which indicate its immediate fatal or dangerous effects. The minor effects are best shown by symptoms affecting the brain and gastro-intestinal mucous membrane. These may fairly be regarded as premonitory symptoms. In connection with the brain, the chief symptoms of uræmic poisoning show themselves as a more or less violent disturbance of the nervous system. This occurs in four forms:—1. Headache, which is probably due to cerebral anæmia; 2. Dimness of vision or amblyopia; 3. Defective hearing; 4. Spasm of voluntary muscles, cramps, drowsiness, or coma.

Gastro-intestinal mucous membrane.—The symptoms connected with this are vomiting, diarrhœa, glazed tongue, and a highly ammoniacal smell of the breath. These last symptoms are attributed to the elimination (vicarious) of urea by the intestinal canal and stomach. These symptoms appearing in a person with a very sallow countenance point to the existence of disease of the kidney. There are often no such premonitory symptoms, and the attack may be altogether unexpected, coming on in a person whose symptoms have never been such as to lead to the examination of the urine. Thus, a physician to St. Bartholomew's Hospital was seized with a uræmic convulsion as he was paying his usual visit in the wards. The graver symptoms include convulsions or clonic spasm, followed by coma, or the latter symptom may first appear and be followed by convulsions. Dyspnœa, due to œdema of the lung, is an occasional symptom of uræmia.

Symptoms in detail.—1. Headache. The pain is chiefly confined to the forehead or vertex, and is not always severe. Sometimes it is bilateral. 2. Defects of vision, amblyopia (dimness of vision), or complete loss of sight. These symptoms are only temporary and there is no organic change in the eye. In apoplectic retinitis, which is likewise a symptom of advanced disease of the kidney, there is rupture of the vessels of the retina, and the blindness is of a more permanent character. 3. Defective hearing is not a constant symptom. 4. Spasm, cramps, state of drowsiness, generally precede the convulsive attack. 5. Vomiting and purging. The onset is sudden or gradual, and the vomiting is not connected with the ingestion of food. It occurs even when the stomach is almost empty. The vomited matters and the alvine dejections are highly ammoniacal. The presence of the carbonate of ammonia indicates an effort to eliminate urea vicariously. 6. Temperature of the body. The temperature presents many variations. In some cases it is very low, in others it may be as high as 105°. 7. Respiration. It is rarely stertorous, generally labial sounds are heard. The respiratory acts are very slow. 8. Œdema of the lung, when it occurs, is almost sudden and ends fatally. 9. Dyspnœa. It generally occurs in paroxysms. The patient may be aroused from sleep by a sense of suffocation.

Besides these functional disorders we often find structural change in uræmia.

Specific consequences of the retention of urea in the blood.—In structural diseases of the kidneys, urea, uric acid, and other products are retained in the blood and in the fluids of the tissues. The blood, therefore, becomes much deteriorated, it grows watery, poor in albumen and in corpuscles, and its fibrin becomes relatively increased. The patient thus becomes anæmic. Special phenomena, as thickening and contraction of small blood vessels, hypertrophy of the heart, dropsical effusions, local congestion and hæmorrhages, œdema of the lung, and functional disorders of the brain and alimentary canal soon occur.

Thickening of the small blood-vessels.—It has been shown that in chronic renal disease, and especially in granular kidney, the walls of the minute arteries of the kidneys and also of the whole body become thick and hypertrophied, and their canals contracted. Some attribute these phenomena to the efforts of the vessels to oppose the transmission of poisoned blood into the tissues. Others believe them to be due to a degenerative change known as hyaline fibroid conversion—a change similar to that which occurs in chronic disease of the liver (cirrhosis) or in sclerosis of the brain.

General hypertrophy and dilatation of the heart is constant in chronic kidney diseases. This condition is said to be due in some degree to sclerosis or increase of the connective tissue, but is mainly due to an extra effort the heart has to make in transmitting the poisoned blood onwards. The large arteries, the valves of the heart, and large veins are healthy, the obstacle is in the small vessels and capillaries, the tension of the arteries being high, as is shown by the sphygmographic tracing.

Dropsical effusion or anasarca is most common in kidney diseases, and first appears in regions in which the connective tissue is lax, as the scrotum and eyelids. Sometimes it is first seen in the feet and legs. In it there is no turgidity nor enlargement of the superficial veins, and the parts are anæmic and waxlike. Dropsy is not due to passive congestion, but is a result either of transudation of serum of the blood through the capillary vessels, or of migration of the fluid through the walls in consequence of heightened pressure of the blood upon them.

Diagnosis.—The convulsions of uræmia resemble those ef epilepsy, but in the former the face is at no time livid but is nearly always pale. Uræmic coma differs from apoplexy in the fact that there is no paralysis ; the dilated pupils distinguish it from opium poisoning. To assist in establishing the diagnosis in a doubtful case of coma or convulsions, the urine should be examined. If albumen be found, the case is most probably one of uræmic poisoning.

Treatment.—In cases of uræmia, the relief of urgent symptoms is the first indication. The urine should be examined with regard to specific gravity and the quantity of urea. If the accumulation of urea in the blood is very large, efforts must be directed towards its elimination, either by the skin or by the bowels or by the kidneys. Where the symptoms are only mild, diuretics and hydragogue cathartics may be given from time to time or repeated every day till the urine increases in quantity, and compound jalap powder is a useful purgative in these cases. Some recommend saline purgatives. That which succeeds best is the following: Mag. Sulph. ℥iss, Acid Sulph. Dil. ʒij, Tinct. Digitalis ʒj, Aquæ ℥viij. An eighth part three times a day. Remedies which promote perspiration, as the Turkish bath or hot-air bath are equally successful, but they should not be carried so far as to lead to exhaustion or prostration. Very often the same effect may be produced by wrapping the patient in a sheet which has been dipped in hot water and covering over with a blanket. Jaborandi and its alkaloid pilocarpin have been freely used in this as in liver diseases associated with retention of bile. It acts on the skin by diminishing the arterial pressure. Jaborandi may be given internally as an extract or tincture, or as infusion. Hydrochlorate of pilocarpine, quarter of a grain, may be tried hypodermically. When urgent symptoms arise, most active measures become a necessity, and in such cases powerful hydrogogues as elaterium, or croton oil may be had recourse to. In cases of œdema of the lung, bleeding from the arm may sometimes avert the fatal issue. During convulsions chloroform may be tried.

Purpura.

This affection is characterised by the presence of dark-red or purplish spots (petechiæ), stripes (vibices), or patches of effused blood which are not effaced by pressure. They occur usually on the skin alone, the blood being extravasated beneath the cuticle, but they may appear simultaneously on the mucous membranes and be accompanied by more or less hæmorrhage. Petechiæ frequently make their appearance in the course of various diseases, such as typhus, scurvy, &c., in which the blood escapes from the vessels of the cutis in circumscribed patches, but in these complaints other prominent symptoms are superadded, whereas, in purpura the eruption is free from any complication. The disease is closely allied to the hæmorrhages. It is probably a disease of the blood itself. A morbid state of the capillaries has been assumed to exist, and it is probable that nutritive derangement of these vessels may favour the effusion, but the disease occurs not only in the feeble, but also in persons apparently well nourished. In an examination of the blood in two cases of purpura the only striking result was a remarkable increase in the quantity of iron, together with a somewhat diminished proportion of the solid constituents in general.

Causes.—These are generally obscure. The complaint is more common in youth and before puberty. Women are more prone to it than men. Unhealthy hygienic conditions, as damp and unwholesome houses, deficient quantity and quality of food, and various depressing agents predispose to it. It is also more liable to occur in persons whose constitution has been depraved by dissipation and excesses. Chronic affections, as syphilis, Bright's disease, and cirrhosis of the liver, predispose to purpura. It has also been noticed in convalescents from severe illness. But the disease occurs also in persons of good constitution, exempt from all those evils and privations, and apparently in robust or vigorous health. Purpura has been known to disappear immediately after a profuse uterine hæmorrhage.

Varieties.—Two varieties are observed—simple and hæmorrhagic. In the former the hæmorrhage appears in crops, and is wholly cutaneous. The spots or the petechiæ are small, well-marked, purple, roundish at first, but not raised above the skin. They are usually distributed on every part of the body. They gradually merge into the colour of the surrounding parts.

Purpura hæmorrhagica (the "morbus maculosus" of Werlhof) is that form in which the hæmorrhage takes place from mucous surfaces, serous cavities, or into the substance of organs as well as into the skin. Hæmorrhage occurs from the mucous surfaces on the slightest provocation, and is generally profuse and serious. Such cases are generally hereditary and regarded as due to a diathesis.

Symptoms.—The appearance of the petechiæ is sometimes, but not always, preceded by various symptoms indicative of depraved health. There are never signs of severe cachexia, as in scurvy. Derangement of the organs of digestion is a very frequent accompaniment. The patient is often pale, the countenance somewhat bloated, and the face puffy under the eyes. There is marked general depression with tendency to uneasiness, fainting, and to pain in the limbs, chest, and abdomen. The appetite is small, and when the food is taken, it produces after a time a feeling of heaviness in the stomach. The tongue is furred. There may be slight giddiness. The pulse is quick and compressible. There may be albumen in the urine. The urea is deficient. In many cases the bowels are constipated. There is also palpitation of the heart, and frequent attacks of syncope. Sometimes the patient becomes sallow and emaciated, and has œdema of the feet. In some cases there are no symptoms of this kind, but the spots alone, small and numerous, appear from the very first. They are purple in colour, and noticed on the legs, thighs, arms, or any other part of the body. The spots often appear in successive crops, lasting a few days. The spots on the skin are variously named. Thus, they are known as petechiæ when the spots are scattered and few, small and rounded; vibices when large and elongated into stripes, and formed by the fusion of several small ones; ecchymoses when larger still and like blotches of irregular outline. The spots are largest, and often first appear in the lower limbs where the return of the blood to the heart is extremely slow. The hæmorrhages from the mucous surfaces take place from the vagina, cheeks, nose, and gums, also from the stomach, lungs, kidneys or bladder, and intestines.

Post-mortem appearances.—The body decomposes very soon after death. There are signs of unusually rapid putrefaction, small bubbles of air oozing from various parts on section. Hæmorrhage is found in the lungs, or between the brain and the membranes, or even in the substance of the brain.

Diagnosis.—The purple spots may be mistaken for flea-bites. In the latter, a central puncture is always present. In purpura, the spots do not fade under pressure. Purpura is distinguished from scurvy by the fact that in the former there is no affection of the mouth. Absence of the history of deficient succulent vegetables, of the carious condition of the gums, of hæmorrhagic inflammation of serous membranes, of indurated and painful swellings about the lower extremities, due to subcutaneous and intermuscular infiltration, excludes scurvy. In purpura the blood is thin and scarcely coagulating, its fibrin is considerably diminished, whereas the blood-corpuscles and solids are not much altered in amount. In scurvy fibrin is much increased in quantity, and the whole solids and blood-corpuscles are found to have fallen below the healthy standard. The treatment of scurvy does not apply to purpura. In purpura the blotches may appear suddenly in persons in good health, and there is no dingy hue of the skin.

Prognosis.—Repeated attacks of both kinds of purpura are common. Death from hæmorrhage is rare, but may occur if proper treatment be not applied. Danger is due to hæmorrhages into the substance of the lung, liver, kidneys, or the brain. It also occurs from the alimentary canal, and even from the gums. The mucous cavities as of the bladder, and the calyces and pelves of the kidneys are also subject to effusion of blood in purpura. Recovery in a few weeks is the ordinary termination, but a condition of intense anæmia may be induced by the frequent recurrence of hæmorrhage.

Treatment.—Turpentine administered in drachm doses at short intervals may safely be given, and will usually stop the hæmorrhage.

Smaller doses do no good. Ergot, tannic acid, and other styptics are used. In every case the bowels must be freely acted upon by aloes, podophyllin, or by calomel and jalap. In young robust subjects, besides purgatives, blood may be drawn from the arm, and other lowering treatment prescribed. Purpura simplex requires pure air, regular exercise, rest in bed, a generous diet, tonics, and especially hæmatinics, such as syrup of phosphate of iron. In purpura hæmorrhagica the bleeding threatens life, and must be stopped. Aromatic sulphuric acid with tincture or liquor of opium, and quinine and diluted sulphuric acid have been given with benefit. When the bleeding is severe and the patient in a state of syncope, the horizontal posture should be preserved and free air admitted. In the treatment of hæmorrhage into the skin use mineral acids internally, and bathe the spots with vinegar.

HÆMOPHILIA.

Hæmophilia, or the hæmorrhagic diathesis, is a condition of the system distinguished by the tendency to spontaneous hæmorrhage, and to violent and obstinate bleeding on any slight solution of continuity. The causes of the disease are unknown. It has been attributed to some abnormal condition of the blood, which is said to be deficient in fibrine, and also to extreme delicacy of the walls of the vessels. According to another theory, the cause is to be found in relaxation of the walls of the vessels, due to paralysis of the vaso-motor nerves. In most cases the disease is hereditary, and, though transmitted through females, it rarely occurs except in males. It sometimes happens that a generation is skipped; thus a father and grandson may be affected, but the son escape. Hereditary predisposition is not found in all cases.

Symptoms.—The condition is usually manifested by the fact that accidents of an unimportant character, such as slight cuts, the extraction of a tooth, &c., give rise to violent and almost uncontrollable hæmorrhage. The blood oozes from, or wells up out of, the wound, and it is very difficult to check the flow which may go on for days, and reduce the patient to a condition of extreme anæmia. In addition to this the slightest contusion is liable to produce extensive extravasation into the texture of the skin and subcutaneous areolar tissue. Spontaneous hæmorrhages likewise occur from the mucous membrane of the nose, bronchi, stomach, intestines, and kidneys; these latter symptoms are usually preceded by palpitation of the heart, stupor, signs of cerebral congestion, pain in the limbs and painful swelling of the joints. The majority of the patients die young, some, however, attain middle or old age, the morbid condition partially or entirely abating. Cases have been recorded of new-born infants dying from loss of blood from the divided umbilical cord.

Diagnosis.—The family history of the lesion and the absence of purple spots distinguish hæmophilia from purpura. The fact that the gums are unaffected will exclude scurvy.

Prognosis.—The hæmorrhage is often fatal in childhood, but if this period be survived and the patient can be kept free from accidents, he may attain to middle or even old age.

Treatment.—Rest, general hygienic measures, and avoidance of all injurious influences are, of course, essential. When any bleeding takes places, strong tincture of matico, or perchloride of iron should be applied, and if these fail, other hæmostatics must be had resort to. Ergot of rye may be given by the mouth in doses of five grains every half-hour, or a grain of ergotine may be injected subcutaneously. The patient should take from time to time purgative doses of sulphate of soda to which dilute sulphuric acid, and digitalis may be added.

ALCOHOLISM.

Symptoms relating to chronic alcoholic poisoning.—Alcohol, when taken into the stomach, is rapidly absorbed. In a very short time its presence may be detected in the urine, breath, and perspiration. When taken in large quantities, its presence can also be detected by chemical analysis after the third or the fourth day. As a rule it disappears quickly from the system. Its effects on the central nervous organs are very striking. Persons who are habitual drunkards generally fall after a while into ill-health. In such persons innumerable functional derangements are liable to occur. They are exposed to many dangers and are apt to be attacked by many diseases, chiefly of the alimentary canal, liver, and the brain. Drinkers, and especially those among them who indulge in beer, exhibit a tendency to grow fat and to become gouty. Cirrhosis of the liver is a common result of spirit drinking, and it is followed by ascites, jaundice, and vomiting of blood. The symptoms of chronic alcoholic poisoning are characteristic, and relate to nervous phenomena, to general appearance, to disordered alimentary canal, to organic visceral changes, and to degenerations. The effects of alcohol on the nervous centres are manifested by delirium tremens, epilepsy, dementia, and general paralysis. Thus we find muscular tremors in limbs, slight at first and controlled by the will; gradually they become constant, worse in the morning, but diminished by food and drink. They are accompanied with sleeplessness, with alarming dreams, the mind is impaired, and there are horrible delusions of various kinds. The patient imagines that persons are plotting his ruin, that insects are crawling about him, &c. He loses courage, and tells lies about drink. There is also impairment of muscular co-ordination. Such persons lose their appetite, have a thickly-furred tongue, offensive breath, the lips are cracked and dry, and nausea is a frequent symptom. In the morning, on leaving the bed they appear dull and apathetic. They are low-spirited and vacillating, and have a dull perception for objects. The affection of the nervous system is known as delirium tremens. The symptoms may occur in a person generally temperate, but who has abandoned himself to violent excesses for several days, or in an habitual drunkard suddenly deprived of the accustomed stimulant. The complaint thus occurs in the form of occasional outbreaks in drunkards who are commencing to abstain.

Objective symptoms.—The patient may be either obese or emaciated. The face is either congested or pale, the features flabby or bloated, venous capillaries appear prominent on the cheeks and nose, eyes red and watery, the pupils dilated, the conjunctivæ injected or yellowish from jaundice. The skin is cold and bathed in sweats. The limbs tremble, as likewise do the lips, when attempts are made to speak, and the tongue is tremulous when protruded. There are constant fibrillar movements or twitching of muscles. In the early stage the pulse is large, soft, and dicrotous; if the complaint takes an unfavorable turn, the pulse is frequent, smaller, and easily compressible. The elevation of temperature is not constant. It usually does not exceed 100°. It may mount up to 105° or 106°. The patient is prone to hallucinations, either ludicrous or alarming, so as to inspire terror. He is suspicious and cowardly, and can generally be brought back to himself or restrained by the voice of authority. In such persons muscular tremors continuing during sleep, great feebleness of the pulse, coma, and epileptiform convulsions are very grave symptoms. These with threatening bedsores point to a fatal termination.

Treatment.—The first object to be attained is to control restlessness and induce sleep. For these purposes chloral and bromide of potassium are extremely useful. Twenty or thirty grains of the latter drug may be given every two or three hours until the desired effect is produced. It is most efficacious in the earlier stages. It may be combined with chloral, or the latter may be given alone. If there be active and furious delirium, tartar emetic and opium are the best remedies. Ice may be at the same time applied to the head. Some practitioners recommend large doses of digitalis in severe asthenic cases of delirium tremens. Opium is another remedy of great service. It is best administered hypodermically, or as a suppository. Care is always necessary, especially in the case of habitual drunkards, who are often the subjects of Bright's disease. The urine should always be examined before administering the opium. If the patient can take food, such as beef-tea, milk, eggs, &c., stimulants should, as a rule, be forbidden. Purgatives are often useful to remove undigested food and to stimulate the secretions.

Chronic Mercurial Poisoning (Mercurialism).

The injurious effects of mercurial vapours, when inhaled, have long been known. They are observed in persons who are habitually exposed to the dust or vapour of mercury. Looking-glass makers, barometer makers, and workmen employed in quicksilver mines not unfrequently suffer. The symptoms vary, but the nervous and muscular systems are principally affected. In most instances an affection of the nervous system is produced, which is indicated by shaking palsy or mercurial tremor, sometimes accompanied by stammering, vertigo, loss of memory, and other signs of cerebral mischief. The mouth and the intestinal canal also become affected. The symptoms of mercurial tremor set in gradually. There is general tremulousness of the hands and arms, a slight tingling and numbness in the upper limbs and occasional pains in certain joints as elbows, knees, feet, and thumbs. The movements are slight at first, and may continue so for years, or may soon pass into a convulsive variety. Sooner or later they extend to all parts of the system, and include the voluntary movements which are thus performed in a spasmodic manner. When the case grows worse the tremblings become constant, and the voluntary movements become difficult; the muscles of expression, of deglutition, of mastication, of articulation, and of respiration, are also affected. The patient cannot lift any object, and walks with jerking movements. The face presents various grimaces, and the utterances are indistinct. There are sleeplessness, delirium, convulsions, and coma. The tremors generally cease during sleep or when the patient is lying down and at rest.

In a vast majority of cases the patients either have previously suffered from salivation, ulceration of the gums, fœtid breath, colicky pains, disturbed bowels, and fever, or they present these phenomena with tremors above alluded to. Generally, after the disease becomes fairly established, the tremors do not cease even during sleep.

When mercury is given internally in small and repeated doses, or applied in the form of an ointment to the skin, the first effect produced is increased activity of the organs of secretion, and especially of the salivary and buccal glands. These effects gradually become more and more marked until what is called ptyalism or salivation takes place. The first symptoms of this effect are slight tenderness and swelling of the gums, soreness of the mouth, swelling of the tongue, metallic taste, and fœtid odour of the breath. The salivary glands soon become swollen and tender, the saliva is enormously increased, absorption is stimulated, and the patient loses weight. Other effects are more or less commonly observed. Febrile symptoms, great prostration, ulceration and sloughing of the mouth, weak fluttering palpitation, constant sighing (similar to that observed in fatty disease of the heart), excessive purging, certain eruptions, notably a form of eczema, symptoms indicating disorder of the nervous system, such as neuralgia, tremor, and paralysis, have all been met with in persons to whom mercury has been administered for more or less lengthened periods.

In the treatment of chronic mercurial poisoning it is necessary first to remove the cause. If mercury is being given internally or by inunction, its use must at once be stopped. The patient should have plenty of fresh air, take a mild purgative, and opium to relieve distressing symptoms. Astringent and stimulating gargles, quinine, alcoholic stimulants, and abundance of nourishing food will all be required for the treatment of the local and general effects of the mineral.

CHRONIC LEAD-POISONING (PLUMBISM).

Persons whose systems are impregnated with lead fall after a while into ill health, and serious consequences are sure to follow sooner or later. Their features appear sallow, pale and earthy-looking; the skin is dry and harsh, the conjunctivæ also pale and yellowish; they complain of metallic taste in the mouth, and great thirst. There is loss of appetite and the breath is offensive. Observations have confirmed the remarkable connection between gout and this affection, the existence of the latter has led to the development of the former complaint. Another malady of equal frequency as a concomitant of lead-poisoning is chronic albuminuria.

The formation of a blue line along the edges of the gums at their junction with the teeth is characteristic. In marked cases similar blue lines may be detected at the margins of any existing ulcers and at the verge of the anus. Colic and paralytic affections are pathognomonic symptoms. Colic is a severe griping pain, and is associated with constipation and vomiting. The pain resembles that which follows an intestinal stricture. It is paroxysmal and referred chiefly to the umbilical region; pressure and friction give relief to the pain. Cramps in the legs are common.

Objective symptoms.—The abdomen is usually retracted, its muscles hard and tense. There are more or less frequent peristaltic movements of the bowels and borborygmi.

Paralytic affections.—Among the nervous disorders dropped wrist, due to paralysis of the extensors of the forearm, is very frequent. When one hand is affected it is usually the right. The paralysed muscles waste rapidly, and while retaining their electro-sensibility they lose their Faradaic contractility. There is no impairment of cutaneous sensibility. Hyperæsthesia of different parts, as neuralgic pains, aching of limbs and headache; motor disturbances, leading to tremors, or convulsions, are frequent. In some cases the wrist is strongly closed from rigidity of the flexor muscles.

The disease may come on gradually or suddenly. One hand, the right, or both hands may become implicated. The patient is unable to extend his hand upon the arm, and to abduct the thumb. When the arm is held out prone, the hand drops, and, although reflex sensibility is retained, the paralysis often extends to nearly all the extensor muscles, and very soon a hollow is perceived between the bones at the back of the forearm. The paralysis is generally limited to muscles supplied by the musculo-spiral nerve in the forearm, the extensor communis digitorum being the one most prone to be affected. The supinator longus escapes. In cases of paralysis in which this muscle is implicated, the complaint is generally due to some cause other than lead. The poisonous effects of lead may be caused by the introduction of the mineral into the stomach with articles of food or drink, into the air-passages in the form of dust or vapour, or from applying remedies containing lead to ulcers. Painters, plumbers, lead-smelters, potters and others whose occupations bring them into contact with preparations of this metal are the most liable to become affected. Water, free from lime salts, which has passed through leaden pipes, has often produced lead-poisoning.

Treatment.—The patient should take frequent warm baths containing potassium sulphide in solution (four ounces to thirty gallons). The internal treatment consists in the use of sulphuric acid largely diluted. Cathartics and opiates are necessary for the relief of the constipation and spasm. Iodide of potassium helps to remove lead from the system. Electricity may be used to stimulate the paralysed muscles.

DERANGEMENTS OF THE CIRCULATION OF BLOOD IN A PART.

The morbid processes classified under this head include congestion and its results; inflammation in various forms and its terminations; hæmorrhage and dropsy; derangement of nutrition leading to alteration in the dimensions and in the quality of tissues. The alterations in dimensions appear in the form of dilatation, contraction, hypertrophy, and atrophy. The changes in the quality of tissues are shown by various kinds of degenerations. Other morbid processes are due to vitiated condition of blood or dyscrasia giving rise to infiltration of tissues, and resulting in growths known as tumours and cysts, the latter being either independent formations, or the result of accumulation of secretion.

CONGESTION.

Congestion or *hyperæmia* signifies an excess of blood in the more or less dilated capillary vessels of a part. The blood circulates with more or less rapidity than usual, according as the condition is of an active or passive character. The relations between the blood and the tissue are altered. The vitality and function of the congested part are very much impaired. The part is always of a dark or livid colour, it is seldom hot, it is neither indurated nor tense, but a sense of weight is often experienced by the patient.

As a result, the congested part is especially predisposed to inflammation from very slight injury, and when inflamed does not rapidly recover; owing to the altered relations between the blood and tissues, a congested part or organ is especially liable to undergo degeneration. Very often its temperature is lowered. The weight is increased, owing to an increased amount of serum which transudes from the congested vessels. When congestion remains long and unabated, it may result in (1) effusion of blood (hæmorrhage), which is one means for its relief; (2) effusion of serum into surrounding tissues (dropsy); (3) fibroid induration; (4) thrombosis or, lastly, in gangrene.

Congestion is of two kinds. It may be active or passive.

Active congestion or hyperæmia signifies dilatation of vessels with accumulation of blood. There is too much blood contained in the part, and the flow is accelerated. It is otherwise called determination of blood. It occurs in the early stage of inflammation. In it the dilatation is observed in the small arteries, capillaries, and small veins. The temperature and sensibility of the part are raised, and a sensation of heat and throbbing is experienced. It is a physiological as well as a pathological process. Physiologically it occurs in the uterus during pregnancy, in the breast during lactation, and in the gums during teething. It also occurs in the stomach during digestion and in muscles during contraction. Similar congestion may be noticed on the cheeks during blushing, and over the whole body on reaction after the cold bath. As a pathological process, we notice a flush or red glow in hectic fever and in phthisis, and in diseases of the spinal cord, congestion of the vessels of the limbs is a frequent symptom.

Passive congestion.—It is a morbid process in which too much blood is contained in a part, and the flow is retarded. The congestion may begin in the heart, or in special veins, or in a system of veins. The veins contain an excess of blood, and the circulation is languid. It occurs in two forms. These may be designated as mechanical and purely passive. They differ widely from one another, both in their causes and results.

Mechanical congestion.—In this variety there is direct obstruction, either internal or external, to the return of blood through the veins. The obstruction is followed by distension of the veins, and by an impeded flow. Various examples may be cited. A common example of *internal obstruction* is afforded by the narrowing of the mitral orifice of the heart, which leads to congestion of the lung. The mechanical obstruction may be a ligature, or a tumour, or an inflammatory exudation product, as seen in later stages of inflammation, where the congested part is swollen and œdematous, owing to dilated vessels and effusion. In cirrhosis of the liver, there is obstruction of the portal circulation, congestion of various abdominal viscera, and chiefly of the mucous membrane of the stomach and bowels. If the congestion is of long continuance hæmorrhage occurs from the stomach and bowels, from rupture of the over-distended vessels. In cases of tricuspid insufficiency we find congestion of the systemic veins and of the internal organs. The over-distension of the capillaries leads to lividity of the nose and cheeks, and of the hands and feet.

External obstruction.—The pressure of the gravid uterus on the iliac veins leads to congestion of the lower extremities. The pressure of enlarged glands upon the veins in the axilla often produces congestion of the upper extremities.

Gravitation is another mechanical cause of congestion. The œdema of the feet and ankles, often seen in delicate persons whose occupation necessitates much standing, is an instance of this kind. The effect of gravitation in producing congestion in the lowest part of an organ in cases in which the heart's action is very weak, is seen in the course of many exhausting diseases. Hypostatic congestion of the lungs is an instance of this kind. It is apt to occur in cases where a patient, in a state of great debility, is confined to bed, and unable to change his position. The blood gravitates towards the most dependent part, and the congestion is still further promoted by the weak action of the heart. The integuments of the back are prone to be similarly affected in such cases. A congested state of the most dependent parts of the body is often seen in the cadaver. As the supine position is the most usual, the appearances of congestion are most frequently presented in the integuments of the posterior parts of the body, in the meninges of the cerebellum, the posterior lobes of the brain and spinal cord, in the posterior portion of the lungs and the most dependent portions of the intestines. Cadaveric extravasation also frequently takes place, and causes the parts in the vicinity of the vessels to exhibit red stains. Sudden removal of external pressure gives rise to hyperæmia. Instances of this nature are the congestion that takes place when, by means of a cupping-glass, the pressure of the atmosphere is diminished over a part, and also that which occurs when the pressure of ascitic fluid on the abdominal vessels is removed by withdrawing the accumulation.

Pure passive congestion.—This form often occurs. It differs from the mechanical form both in its cause and seat. Pure passive congestion is due to vital causes, viz., to some impairment of the vital relations between the blood and the tissues. Some suppose it to be due to paralysis or loss of power of the *nervi vasorum.* In consequence of this the walls of the vessels become weak, and yield to the normal pressure of blood. In emphysema and chronic bronchitis there is generally passive congestion of different parts of the body. In the former the blood is not sufficiently aërated, and reaches the capillaries surcharged with carbonic acid gas. Passive congestion in these vessels is the result, and is caused by the arrest or impairment of the processes, which normally take place between the blood and the tissues. Other instances of passive congestion are seen in the blueness of the extremities when exposed to cold, and in the redness of the ears and nose in persons whose circulation is feeble. Congestion is an atrophic condition, and its effect is the same with that of a deficient supply of blood, as is proved by the frequent occurrence of ulcers in congested parts.

INFLAMMATION.

It is a reaction of the whole body or of any of its parts against the injurious effects of an irritant. It is an exaggeration or perversion of the existing normal process or reaction between the blood and tissues, and is a local change in the natural act of nutrition existing in the part affected. These changes of the histological elements are characterised either by a diminution in their nutritive activity, as occurs in atrophy and degenerations, or by an increase, as in hypertrophy and new growths. Besides local lesions of nutrition in the process of inflammation, we also find associated changes in the circulation, and in blood-vessels. Inflammation is thus a succession of local changes which take place when a tissue is irritated or injured either directly or indirectly. The direct irritation may be the result of either chemical or mechanical agents, or of substances conveyed to the tissue by means of the blood-vessels or the lymphatics; as an instance of indirect causation may be mentioned exposure to cold producing inflammation of internal organs. It is a collection of morbid phenomena which are essential in a majority of diseases.

The local lesions of nutrition are exhibited by the following phenomena. 1. Changes in the blood-vessels and circulation (concentric vascular excitement). 2. Exudation of liquor sanguinis (excessive, and more or less altered in quality). 3. Occurrence in the intervascular spaces of growth and proliferation of protoplasmic cells. 4. Multiplication and escape of white corpuscles (leucocytes). Inflammation is not always hurtful in its action. Thus in local injuries it often leads to the formation of bands of adhesions between the two surfaces; it also aids in preventing the local injurious effects of irrritants. In cases of rupture of hollow viscera, its results prevent the contents from escaping into the neighbouring serous cavities. Inflammation is an effort of nature to destroy, remove, or throw out that which is injurious to the system. It also tends to restore or repair that which is injured or destroyed. Where inflammation is hurtful the mischief is due to the overactive proliferation of cell elements, the deposit of a new product which becomes organised, or to the impairment of nutrition. In the latter case the resulting processes are those of interstitial disintegration, ulceration, gangrene, &c.

The state of blood-vessels and blood in or about an inflamed part.—Inflammation is known by redness of the part and this is due to accumulation of blood in the relaxed and distended vessels. At first the small arteries are dilated and contain larger quantities of blood. The flow is also accelerated. There is attendant swelling which is due to accumulation of blood and infiltration from exudation, or new growth. While the inflammatory processes are going on in an inflamed part, outside the vessels there is an increased demand for nourishment. The vessels therefore further dilate and attract more blood.

State of the vessels.—The first effect of irritation is to cause dilatation of the arteries; after a time similar dilatation of capillaries and veins occurs. The dilatation is then accompanied by increase in the length of the dilated vessels which also become tortuous. With these changes the rate of the flow of blood is increased. This increase is followed by a normal flow and finally retardation occurs. During all this time the vessels continue to remain in a dilated state. The retardation first commences in the veins, the blood current then becomes slow and fluctuating in the capillaries until ultimately stagnation takes place.

State of the blood.—With the stagnation the blood loses its serum; the white corpuscles adhere or cling to one another and accumulate in the veins. They adhere to the walls of the vessels which are plastic and less fixed.

Migration of the leucocytes.—Soon after the retardation of the current of blood in the vessels of the inflamed part, the white corpuscles penetrate the walls of the vessels and pass into the surrounding tissues. In this new situation they divide and subdivide and thus multiply and increase in number. The red corpuscles which lie in the centre also collect in masses, especially in the capillaries, and they also migrate by penetrating the walls of the vessels, into the tissues external to them. The stagnation of blood is most marked in those capillaries which are situated in the focus of inflammation. Here there is complete stagnation and no movement or emigration of corpuscles takes place.

Around this focus there is always a zone of congestion. In it the blood is circulating very slowly and both red and white corpuscles migrate. Beyond this there is another zone of determination, and here the white corpuscles only escape from the veins.

Exudation of liquor sanguinis.—With the passage of blood-corpuscles through the walls of vessels, exudation of liquor sanguinis or of lymph takes place. This exudation is otherwise known as inflammatory effusion. This fluid effusion is different from the dropsical fluid which results from passive congestion, as it contains a large proportion of albumen and fibrin, and also an excess of phosphates and carbonates. The inflammatory effusion also contains numerous cell-structures of various kinds. These are products of the inflamed tissue. The quantity and nature of the effusion vary with the nature of the tissues and with the severity of inflammation. It also produces different results according to the circumstances attending its escape. In non-vascular tissues, as the cornea and cartilage, the effusion is small. In cases where the surrounding parts are lax it produces marked infiltration and œdema in the parts around. In inflammation of the liver and kidney, where the structures are compact, the effusion is scanty, and always mixed with other elements of the organs involved. In inflammation of the mucous membrane, owing to looseness of structure and the slightness of support afforded to the vessels, infiltration and effusion are especially manifest. The effusion (catarrh) takes place from their free surface, and contains numerous cellular elements.

In inflammation of serous membranes the effusion consists of serum or of liquor sanguinis. It is generally abundant. Effusions in shut sacs as in ascites, pleuritic effusion, &c., are examples of this kind. The fibrinous effusion has a tendency to coagulate and form bands, which adhere to the surface.

If the blood from an inflamed part be drawn off and allowed to coagulate in a vessel it exhibits a buffy or *yellow coat;* its upper surface is concave or cupped. The buff may be due to a slow coagulation of fibrin, to the red corpuscles in the centre running together rapidly, and therefore sinking to the bottom; the upper layer is quite free from red blood-corpuscles before the fibrine coagulates, and is therefore light in colour; the fibrine contracting still more gives to the upper layer a concave or cupped appearance.

State of the inflamed tissues.—The nutrition of the elements of the inflamed tissue becomes deranged, and probably increased chiefly as regards cell structures. There is a tendency to cell proliferation or cell growth. There is generally an increase in the form and movements of cells and also in their growth. This may result from an increase in size of already existing cells and their nuclei, or from the division and subdivision of these nuclei and the cell contents, or from the new cells being formed by an endogenous process. The nutrition subsequently becomes impaired when the cells decay and degenerate, or develop into a lowly organised tissue.

As a rule new cells are less developed than the original cell structures; they are more prone to undergo degenerative changes, and if once formed into a tissue the growth is always inferior to the original tissue or organ.

Where the inflammation is intense the nutrition becomes completely arrested and gangrene results.

Pathology.—The mutual vital relations between blood, blood-vessels, and tissues are much disturbed in inflammation. When a tissue is irritated directly or indirectly there is at first increased vascularity, and the current is accelerated. This is due to an impression being produced on the centripetal nerves, and thence communicated to the vaso-motor centre. From this it is then reflected to the vessels of the irritated part. Subsequent slow current or retardation, followed ultimately by stasis, as well as the emigration of the corpuscles, is owing to changes which take place in the properties of the walls of the blood-vessels with which the blood comes in contact. The vessels dilate, their walls relax, the corpuscles adhere to their walls, and the condition of the vessels being altered all these phenomena occur. There is a tendency to proliferation of the protoplasm or of the cell elements of the part. The cells resemble leucocytes, and go to form granulation tissue or some forms of connective-tissue corpuscles.

Causes of inflammation.—These may be classed under two heads—predisposing and exciting. The chief predisposing causes are defective innervation, previous attacks of disease, the poison of syphilis, rheumatism, gout, &c., plethora, or the reverse, hereditary tendency to diseases such as scrofula, &c. The exciting causes are mechanical, as any local irritant, or violence; chemical; great heat or cold; inoculation with infective materials. With reference to the last-mentioned cause, it is now pretty clearly demonstrated that all such infective substances contain certain minute organisms named *bacteria*, and these are further believed to be the active agents in producing inflammation when fluids containing them are introduced into the system. The condition known as pyæmia, which is characterised by the development of inflammatory foci in various parts of the body, can be artificially set up by injecting small quantities of decomposed albuminous fluids into the circulation, and the intensity of the symptoms appears to bear some direct relation to the number and forms of bacteria which the infected fluid contains. Another view recently put forth is that the bacteria are not themselves the excitants of inflammation, but that they act as carriers of the poisonous material, whatever that may be. On the other hand, it is alleged that the presence of bacteria in a decomposing fluid is not a necessary condition for the possession of infectious properties. The question as to the part played by these organisms in producing inflammation still awaits solution.

Symptoms.—There are local signs and constitutional symptoms. *Local* signs are almost always present. These are heat, redness, swelling, and pain.

Heat is evident to the touch and can be measured by the surface thermometer. It is due to the increased supply of blood to the part and to the rapid changes in progress.

Redness is due to the accumulation of blood in the dilated blood-vessels. It is most marked in the centre of inflammation and fades at the circumference, disappearing for a time on pressure; it may vary from a bright crimson to a dull purple. The intensity of colour and its hue depend on the degree of distension and the preponderance of arterial or venous repletion. The brighter the hue the more intense the inflammation.

Swelling varies with the degree and the seat of imflammation and the rigidity of the part inflamed. It is due partly to dilated blood-vessels and partly to effusion and growth of the tissue.

Pain.—Pain is due to implication of the sensory nerves in the morbid process or to pressure on these structures. It varies with the nature and the kind of tissues affected. In the unyielding tissues, as the fibrous or bony tissue, it is agonising and severe. In the loose mucous membranes it is very slight. In the skin and in mucous membrane, when it is present, it is itching, tingling, or burning. In serous membranes, stabbing, or lancinating. In bones, aching. The pain may be *sympathetic*, and felt in parts distant from the seat of inflammation, as in the knee in hip-joint disease. In a case of inflammation, one or other of these symptoms may be absent. In inflammation of the internal organs, the only observable symptom present is pain. In such cases the derangement of their functions therefore constitutes one important means of discovering the presence of inflammation.

General or constitutional symptoms.—Soon after inflammation is set up in a part, it affects the system generally. The heightened temperature and the alterations in the blood lead to deranged nutrition and functions of the whole system. The excitation of the vaso-motor nerve-centres causes an increase in the amount of tissue-change, and the temperature of the body is therefore raised. This condition is known as inflammatory fever, secondary or symptomatic fever, or the pyrexial state. The high temperature is supposed to be due to inordinate consumption of nutrient matter. The affected part also generates much more heat, which is spread to other parts and aids in producing fever.

In inflammation there is abundant proliferation of tissue, excessive effusion from the blood-vessels, and active disintegration. The products of these various processes are taken up by the lymphatics and poured through the thoracic duct into the systemic veins. As a result, the blood becomes rich in fibrin. The emunctories discharge these morbid products, which are the main sources of excess of urea in the urine. The heightened temperature and the deteriorated blood influence the nutrition and functions of all parts of the system.

The febrile symptoms which accompany inflammation vary as the subject is sthenic or asthenic, and also according to the tissue affected. In strong robust individuals they set in with chills or rigors, followed by heat and dryness of the skin. The fever comes on in paroxysms at irregular intervals. The symptoms are usually aggravated towards night, when a distinct rise of temperature generally occurs. The pulse is quick, and generally small, hard, and incompressible, or it may be full and bounding. The respirations are hurried, the secretions scanty, the mouth parched, the bowels constipated. There is usually great thirst. The patient has disturbed sleep, and feels languid and weak in the morning. The urine is scanty, high coloured, of high specific gravity, and also turbid, from its containing more lithates and less chlorides. During the fever the chlorides are diminished. The fever is somewhat different in tropical countries : in them the skin is hot but not pungent ; the temperature of the trunk is higher than that of the extremities ; the pulse is soft and small ; the tongue furred in the middle and florid at the tip and edges, and the bowels have a tendency to become loose. In *anæmia* the fever assumes a low typhoid character ; the pulse becomes more feeble and frequent, and sometimes barely perceptible ; the tongue more dry ; there are sordes along the lips and gums. Hiccup, hurried breathing, and coma supervene. If such cases terminate favorably there is a period of crisis, followed by slow convalescence.

If inflammation remains unrelieved for some time the patient rapidly loses flesh and strength, and typhoid symptoms set in ; or the inflammation runs on to suppuration, the fever assumes a hectic character, and is attended with profuse sweating. Where resolution takes place the fever disappears, the pulse becomes soft and less frequent, the skin cool and perspiring, and the urine abundant, throwing down copious deposits of lithates and a large proportion of urea.

Varieties of inflammation.—Inflammation varies (1) according to the severity of the process ; (2) the organ or tissue implicated ; (3) the nature and mode of operation of the cause. It also varies with the extent and duration of the process.

Severity of the process.—Inflammation is said to be acute when the irritation is severe and the vascular phenomena are of a marked character. The action of the irritant is usually of short duration, but the damage to the blood-vessels is great, and there is greater tendency to the exudation of liquor sanguinis and the emigration of the white corpuscles ; there is proliferation of cells—all leading to the formation of pus and softening and disintegration of tissues.

When the inflammation is less severe, the changes in the condition or elements of the tissue are most prominently marked, the vascular phenomena are mild, and the formation of pus is less noticed. The textural changes vary with the kind of tissue involved in the process and with the severity of the irritant. In cases where the irritation is less severe the textural changes are limited to the connective tissue immediately adjacent to the blood-vessels and lymphatics. In severe cases more distant elements are also involved.

In acute inflammation of mucous membranes the textural changes are attended with proliferation of the epithelium, whereas in a less severe form, the changes are limited to the sub-mucous tissue.

Chronic inflammation.—Inflammation is said to be chronic when it is continuous and of long duration. An acute attack often becomes chronic. This is the least severe form of inflammation. The irritant which produces it is slight and also of a long duration. The textural changes are limited to the connective tissue adjacent to the blood-vessels and lymphatics. Chronic inflammation is also characterised by certain peculiarities. The new tissue formed round the blood-vessels and lymphatics consists at first of small round cells, which are gradually developed into a fibrillated structure. It is then known as fibroid tissue. As a result of this process the organ so affected becomes at first thick and indurated; gradually the interstitial tissue pressing on the gland elements leads to their atrophy and degeneration, and destruction of the whole organ. Cirrhosis of the liver is an example of this kind.

Another variety of inflammation is one dependent upon the nature of the injury. Mechanical or chemical agencies produce the form known as traumatic. Inflammation is said to be idiopathic where the nature of the irritant is not obvious. Cases of infectious inflammation are those due to the transmission of infective materials through the blood-vessels or lymphatics. The morbid material is transmitted from some local centre, as occurs in cases of dissection wounds, pyæmia, and in acute miliary tuberculosis. Inflammation is said to be specific when the nature of the *materies morbi* gives to the inflammatory process certain peculiarities, as, for example, in syphilis.

Another variety is marked by the extent of the inflammatory process. Thus in pneumonia, peritonitis, and erysipelas whole organs or membranes may be involved. In cases of typhus fever and typhoid, and in lobular pneumonia, its effects are manifested in a more limited form.

Another peculiarity has reference to its results. In cases of carbuncle its tendency is to end in ulceration or gangrene; in the case of scarlet fever, in desquamation of the epidermis. In measles the inflammatory process is slight, and ends in superficial detachment of the epidermis.

Special peculiarities of each tissue in inflammation.—In the areolar tissue inflammation is not attended with much pain and suppuration is common. It may end in resolution or organisation. The subcutaneous areolar tissue and the connective tissue of organs and other parts are the most common seats of the inflammatory process. In a *serous* membrane there is marked redness, loss of polish; the tissue is opaque, highly vascular, and thickened; there is tendency to the effusion of serum (organisable) and plastic lymph between its two surfaces, by which they become adherent. When the quantity of liquid is great, adhesion is prevented until absorption takes place; when the inflammation is severe the effusion is apt to become purulent. In inflammation of a mucous membrane the surface is dry at first, an exudation is then poured out which may be a mere increase of its normal secretion, may contain large quantities of fibrin, may be purulent or bloody, and lastly, may be associated with destruction of the submucous tissue. The terms *catarrhal*, *croupous*, and *diphtheritic* are applied to three well-marked varieties of inflammation in a mucous membrane.

Results or the terminations of inflammation.—Inflammation may terminate by—

- I. Resolution, or
- II. Exudation or Effusion
  - *a.* Reabsorption.
  - *b.* Development of a new tissue or formative lymph
    - 1. Enlargement.
    - 2. Induration.
    - 3. Softening.
  - *c.* Degeneration, or destructive lymph
    - I. Corpuscular and
      - *a.* Pus
        - Thrown off.
        - Reabsorbed.
      - *b.* Ulceration.
      - *c.* Mortification.
    - II. Less organized tissue
      - 1. Fatty.
      - 2. Calcification.
      - 3. Pigmental.
      - 4. Fibroid.
      - 5. Colloid.
      - 6. Amyloid.

I. *Resolution* is a complete restoration of the inflamed part to its normal state, the local symptoms subside, the blood, blood-vessels, and tissues are restored to their normal condition. Hyperæmia is diminished, emigration of corpuscles ceases, some of the exudation cells undergo fatty changes and become absorbed, others are removed by the lymphatics. Where resolution takes place very quickly the inflammation may change its seat and attack some other part. This is termed metastasis.

II. *Effusion* or exudation is an escape of fluid from the vessels. It may be—1, of serum, as in hydrocele or pleurisy with effusion; 2, of liquor sanguinis; 3, of fibrin (coagulable lymph), as in granulating wounds; 4, of blood, as in dysentery; and, 5, of mucus discharged from the surface of the mucous membranes. Effusions undergo—(*a*) reabsorption or removal by the lymphatics, the tissue generally returning to its normal condition; (*b*) organisation. The young cells become more fully developed, and ultimately form a fibrillated tissue. This organisation is seen in the healing of wounds by first intention. There is effusion of coagulable lymph in the inflamed part. In chronic inflammations of the liver, kidney, and other organs a formative development of a new tissue occurs which may end in enlargement, induration, and softening. The kind of tissue so developed is the fibrous, fibro-cellular, or, in some cases, a tissue nearly allied to that which is diseased. It is rarely converted into muscular or nervous tissue. Another result of effusion besides reabsorption and organisation, consists in *suppuration.* This occurs when the injury is very severe or the inflammatory processes are of a long duration. In this condition, the proliferated and emigrant leucocytes infiltrate the tissues and accumulate therein. This is known as destructive effusion. When the pus becomes collected in a circumscribed manner within the tissue it forms an abscess. In other cases it is discharged from the surface, as in a granulating wound. Healthy or laudable pus is a thin, yellowish-white, creamy fluid, unctuous to the touch, slightly sweetish in taste, and without any smell. Its reaction is alkaline; specific gravity 1030; it consists of liquor puris, a great abundance of pus-corpuscles to which its opacity and whiteness are due, granules, and nuclei. The pus-cells are spherical in shape, $\frac{1}{2500}$ inch diameter, distinctly cellular, containing a compound or simple nucleus and granular substance, which becomes clear on the addition of acetic acid. The liquor puris, like the serum of blood from which it is derived, contains albumen, inorganic substances, fatty matter, and salts. The pus-corpuscles or cells are globular in form and resemble leucocytes. They are in fact the white blood-corpuscles which have escaped from their vessels, and the proliferated cells of the tissue. During inflammation these cell elements undergo active changes and form new cells, and when the inflammation is very intense, the latter are either slowly organised or converted into pus-cells. While living they have the power of spontaneous movement, and they migrate into the tissues; they also send out processes and undergo various changes of form. In the early stage of severe inflammation we find migrated leucocytes in the tissues, but as inflammation advances an increase by cell-proliferation and endogenous formation also takes place. Other varieties of pus are often noticed. These are—*sanious*, when mixed with blood. Thin and acrid or *ichorous*, when it contains flakes of lymph. *Cheesy* or *curdy*, when the fluid part is absorbed and a pultaceous mass remains. *Grumous*, when mixed with degenerated tissues and blood. All these varieties are due to the condition of the patient and of the part affected. Where bacteria or other living organisms are mixed with pus it undergoes putrefaction and becomes fœtid.

Phenomena attending suppuration.—The suppurating part is inflamed at first, and while inflammatory proliferation is going on, the tissues between the groups of cells gradually get removed, the cells then form one uniform mass of cohered tissue; as the cohesion lessens an abscess forms. The part is now swollen, tense, and throbbing, the central portion of the proliferating tissue next becomes soft and fluctuating, and the skin over it red and shining. The cells which would have otherwise formed healthy tissue become converted into pus-cells. The pus is either removed by absorption, or by extension of the softening, the abscess increases in size, and more corpuscles are added. A cavity being now formed there is rapid migration of leucocytes and protoplasmic cells from the periphery. Thus by such processes the abscess reaches the surface, points, and bursts. It is believed that the pus-corpuscles have the power of softening down the tissue with which they come in contact, and thus causing its liquefaction.

Composition of pus.—It varies with the locality from which it comes and the circumstances under which it is formed. Thus the pus of an abscess in the breast is different from the pus from an abscess in the liver. The pus from smallpox pustules is also different from that in syphilitic pustular eruptions. The proportion of organic matter is very large, and when exposed to the air pus is particularly liable to undergo decomposition. Thus decomposed it becomes more decidedly alkaline and evolves carbonate and valerianate of ammonia.

Mode of origin of pus.—Its liquid portion consists of the serum of the blood. The pus-cells are derived both from the blood and the cellular elements of the inflamed tissues. An abscess having once formed, the pus which has remained for any length of time in the tissues undergoes certain changes. Its corpuscles degenerate; the liquid portion becomes absorbed; the cells atrophy, and gradually form a fatty detritus. In a closed cavity, pus often becomes converted into a caseous mass which may subsequently undergo calcification. Destructive results of inflammation are often shown in the formation of pus by the disintegration of cartilages, bones, and connective tissue. Similar destructive changes are seen in fatty and other degenerations of muscles and nerves. Other forms of destructive changes exist and are known as ulceration, gangrene, and necrosis. When an ulcer is formed there is a molecular but progressive destruction of a part. When an abscess has burst, it leaves a chasm or an ulcer. But ulceration may occur without an abscess. Thus when intense or severe inflammation affects the skin or the mucous membranes it leads at once to the destruction of a portion of the tissue, leaving a chasm or an ulcer. The destruction of the tissue is due to the absorption by the vessels or to discharge from the surface.

Gangrene.—Another destructive effect of the inflammatory process is gangrene. In this change of tissue, the circulation of the part affected is either impeded or arrested. The inflammation is intense and persistent, and the vitality of the patient or of the part affected is extremely low. In gangrene a larger or a smaller portion of the tissue is separated from the surrounding textures. The inflammatory gangrene of internal organs is characterised by an intensely fœtid discharge. The parts are swollen and infiltrated with effusion, which contains fragments of destroyed tissue. Certain inflammations have a tendency to end in gangrene, as erysipelas and diphtheria. All those agents which tend to destroy vitality of all the elements of a tissue lead to gangrene. Thus gangrene may result from external violence, heat or cold, the application of corrosive substances, from the effect of poisons, as phosphorus and ergot of rye, introduced into the blood. The diminution of vitality may also be due to obstruction in the arteries. The obstruction may be a blood clot in the interior, thickening or atheroma of the walls, or some pressure from without.

In many cases, inflammation instead of terminating in entirely destructive processes is eventually followed by granulation and organisation, as results of the suppurative and ulcerative stages. A process of repair and restoration thus becomes established. The fact has been already alluded to that one result of acute inflammation is the production of large quantities of embryonic tissue of a low type of organisation, the intervening tissue melting away and disappearing. In the case of inflammation of the serous membranes, the newly formed cells entangled in the meshes of the fibrin throw out delicate processes and form a kind of network. At the same time new vessels start into the adventitious tissue. In the case of inflammation of a solid organ, the organisation of the inflammatory products is effected by the cells becoming converted into connective tissue, and the formation of capillary offshoots by a process of budding-off from the side of a vessel. These buds enlarge and unite with others.

Inflammation often exhibits a tendency to spread from the part originally affected. Thus in dysentery, the lower part of the large intestine is the portion first attacked, but the whole of the colon may become involved and even the lower part of the ilium. Erysipelas also usually spreads with more or less rapidity. In serous membranes the inflammatory process, starting perhaps from a small area, is apt to spread over the entire surface, and neighbouring parts sometimes become involved. In croupous and especially diphtheritic inflammation, the tendency to spread is very marked and often constitutes the principal source of danger.

Treatment.—Local and general. Remove the cause if possible. Keep the part inflamed at perfect rest, and in an elevated position. Obtain, if possible, resolution; failing this, either termination, adhesions, or suppuration. Attend to the urgent constitutional symptoms, diminish the fever, and free the secretions. For the increased vascularity in the inflamed part, if the patient be plethoric, venesection may be tried. If the part feels œdematous and congested, leeches, cupping, scarification, punctures, or incisions may be required. Medicines which have a powerful influence over the heart, and act in diminishing its force, as aconite, veratrum viride, digitalis, tartar emetic, may be given. To promote secretions, purgatives, diaphoretics, and diuretics should be used with caution; purgatives do harm when given in inflammation of the bowels. Very often in inflammations affecting only the superficial parts or in their early stage, the application of cold or heat and moisture, or medicated fomentations are of service; even the application of iodine paint to the surface has been tried with success. In asthenic cases stimulants from the first are necessary. Exudations should be removed if possible, or the absorption promoted. Mercury, iodide of potassium, and alkaline carbonates internally, and blisters, iodine paint, irritants, stimulants, issues, setons, plasters, or even the actual cautery externally, are the chief means by which these objects are effected. The constitution requires treatment on general principles. Fever, or any other urgent symptom, as pain, &c., needs special attention. Every precaution must in the first instance be taken to prevent suppuration, but if suppuration be inevitable promote it by poultices, at the same time supporting the strength by generous diet with ammonia and bark. In some inflammations mercury acts as a charm. In inflammation of the mucous membrane, or of the connective areolar tissue, or where suppuration is threatening, it should be used with very great caution; it is absolutely injurious if given in cachexia (unless due to syphilis), scrofula, and in diseases of the kidneys. It is highly useful in inflammations of the serous membranes, and in those of the brain and spinal cord where the exudation-product has no outlet of discharge and produces impairment of functions.

HÆMORRHAGE.

Hæmorrhage means either a slow exudation of blood in its entirety from the vessels, or its more or less rapid escape in a gush. It may be either spontaneous or traumatic. Spontaneous hæmorrhage generally occurs when either the arterial (active) or venous (passive) congestion remains long and unabated, and it is one of the principal means of relief. Thus, in cirrhosis of the liver, hæmorrhage occurs from the stomach and bowels, in mitral obstruction, into the substance of the lungs (pulmonary apoplexy), in infantile convulsions, from the brain (cerebral apoplexy), and in varicose veins, from the distended vessels. In all these cases there is rupture of over-distended vessels. The rupture may occur from injury when the vessels are healthy. In disease, as ulcers or an abscess, the rupture is due to degeneration of the walls of the vessels. Emigration of the corpuscles from the vessels into the surrounding tissue has been noticed to occur without solution of continuity.

Seat.—Arteries, veins, or capillaries. Hæmorrhage may occur on a free cutaneous, serous, or mucous surface, upon the surface of an organ, in the interstices of tissues, or in the substance of any organ. When, owing to any obstruction or congestion of a vessel, blood is poured out into the parenchyma of an organ, but the parenchyma not at once destroyed, it is called hæmorrhagic infarction or apoplexy.

Results of extravasation of blood.—When occurring externally the effects vary with the amount and the rapidity of the hæmorrhage, and with the constitution of the patient. When it flows in large quantities and in a gush, death may speedily result. When hæmorrhage takes place into the cavities of the body or into an organ, the blood causes laceration of the tissue or the organ, and leads to impairment or destruction of function. The effused blood also sets up irritation by acting as a foreign body, and induces inflammation and derangement of nutrition and function of the part affected, and also of the surrounding textures. In some cases the blood or the effused products undergo further changes. In favorable cases the fibrin of the extravasated blood undergoes degeneration and is absorbed, the surrounding lacerated tissues then recover their tone, the hæmoglobin of the blood-corpuscles is converted into pigment, which, in the course of time, assumes a granular or crystalline form. These pigment granules and crystals are characterised by their durability and great powers of resistance. Sometimes the coagula shrink and become encapsuled, or lowly organised into fibrous tissue.

Occasionally, however, the remains of the hæmorrhage consist of a deposit of minute crystals of hæmatoidin.

Character of blood.—Quantity.—In apoplexy it may vary from a few drachms to many ounces. When it takes place within an organ (infarction) the quantity effused is slight, and may weigh only a few grains.

Quality.—When slight the blood is liquid at first, but it coagulates more or less rapidly. When hæmorrhage is considerable the blood is of a florid-red colour, poured out in a gush, stopping as suddenly as it began. If collected it coagulates very speedily. In weak and anæmic persons it is generally of a dark colour, and flows from several parts. In youth the seat of hæmorrhage is generally the Schneiderian membrane (epistaxis) ; in adults the lungs and bronchial tubes ; in old age hæmorrhage is most common in the brain or from the hæmorrhoidal vessels.

Varieties.—1. Traumatic, as from direct injury to a vessel, *e. g.* by a blow, from injury to delicate structures, *e. g.* hæmorrhage from the rectum or from the bladder, caused by hardened fæces and calculus respectively; or indirectly by extension of ulceration, as hæmorrhage from the bowels in enteric fever.

2. Passive hæmorrhage may occur in diseased conditions of vessels and in cases of constitutional weakness, in deranged and low conditions of the blood, such as occur in anæmia, scurvy, purpura, and typhus fever. Hæmorrhage also occurs in cases of passive congestion, as in diseases of the heart, liver, spleen, or kidneys. Degeneration of vessels, poor living, excessive discharges, as from the stomach and bowels, lead to it. In scurvy and purpura the hæmorrhage is due to the altered constitution of the blood, which perhaps contains less fibrin than in health. Certain poisons in the blood lead to hæmorrhage. Thus instances are known of hæmorrhages in cases of smallpox and typhus fever. In both cases the blood is deprived of its power of coagulating and bleeding occurs.

3. Active hæmorrhage occurs in cases of plethora, with determination of blood to a part. In these cases the fibrin in the blood remains the same, and the blood contains an excess of red corpuscles. Epistaxis in young people is an example of active hæmorrhage. The menstrual flow in the female is another example. Similarly, the vicarious flow which is supplemental to other hæmorrhages, as in females who menstruate through the breast or through the lymphatics, is another example of this kind.

4. Spontaneous. It often occurs in purpura hæmorrhagica. In this condition profuse bleeding is apt to take place from the gastro-intestinal and urinary mucous membranes. The violent hæmorrhage which follows a very slight scratch in hæmophilia may be considered

as almost spontaneous. Similarly the most trifling cause, as extraction of a tooth, a leech-bite, or biting the tongue, often leads to alarming hæmorrhages. (See page 205.)

5. Secondary. Is that in which the blood is effused from the ruptured vessels of the inflammatory products, which have recently become vascular. Hæmorrhagic pericarditis is an example of this form of hæmorrhage. The new vessels which are developed in the organised effusion are peculiarly delicate, and are very prone to give way from the operation of slight causes.

Symptoms of hæmorrhage.—In strong plethoric persons it is preceded by a sense of fulness and heat in the part. There may be coldness in the hands and feet, and a great feeling of chilliness. In every case after hæmorrhage there is pallor of the countenance, the pulse is very feeble, and even fluttering, there is tendency to faintness and great thirst. In rapid hæmorrhage the symptoms are most alarming. There is great depression, deep sighing respiration, dimness or imperfection of vision, cold extremities, syncope on attempting to sit up, great restlessness, and wandering or delirium. When death approaches the patient feels ease, contentment, and a desire to be left alone.

Prognosis.—It is very unfavorable if the hæmorrhage takes place into serous cavities, into the substance of organs, and if there is any history of the hæmorrhagic diathesis.

Treatment.—There are two main points to be attended to in the treatment of extravasation of blood in medical cases. These are: try to stop bleeding, and to prevent its recurrence by improvement of the general health. To stop bleeding the patient should have perfect rest, and should lie in an horizontal position. The temperature of the room should be low, and all disturbing influences rigorously avoided. Locally, the application of ice, astringent application of strong tincture of matico or of perchloride of iron, and pressure over these applications may be resorted to. For internal use the drugs chiefly to be relied on are gallic acid in 12 to 15-grain doses; aromatic sulphuric acid ʒss, sulphate of alum and sulphate of potash gr. xv to gr. xx. All these should be repeated every two, four, or six hours according to the urgency of the case. Ipecacuanha in frequently repeated doses, till nausea is produced, is another remedy. Infusion of matico may be given internally. Half-drachm doses of extract of ergot or the hypodermic injection of ergotine may be resorted to. This and digitalis, from their action in causing contraction of the small vessels, succeed well in obstinate and recurring cases. The oil of turpentine in twenty to thirty drops may be given every two or three hours. Liquor Hydrargyri Perchloridi has been recommended, but should not be given if the hæmorrhage be pulmonary or renal. Sulphate of soda acting as a hydragogue, and thus diminishing the amount of serum in the blood, and also as a chemical salt, promoting coagulation, is highly useful in hæmorrhages, and may be given in full doses. In profuse bleeding and in cases of exhaustion, as in hæmorrhage after delivery, opium is highly beneficial; it sustains life and also acts as a tonic and astringent. It acts as a stimulant to the heart, aids and sustains nervous power and causes contraction of capillary vessels. All those remedies which promote coagulation of blood may be prescribed. Of these acetate of lead and opium stand foremost in the list. Should the bleeding be profuse and followed by a loss of consciousness, and if there is inability to swallow, and where other means for resuscitation have failed, transfusion of blood as a last resource may be had recourse to. For this purpose fresh blood (three to twelve ounces) free from fibrin should be injected very slowly into the vein of the sick. In the after-treatment of hæmorrhage good nourishing diet should be given in small quantities and repeatedly. The health must be improved by fresh air and tonics.

DROPSY.

Dropsy is an effect of long-continued passive congestion, and results from a disturbance of the balance between absorption and secretion. It signifies (1) infiltration or accumulation of serous fluid in the areolar tissue; (2) effusion into closed sacs or into the interstices of the connective tissue of a part. The fluid is an effusion through the coats of the vessels.

Causes.—All those circumstances which mechanically impede the venous circulation, or alter the healthy condition of blood-vessels or of blood, *e. g.* retention of water in the circulation, due to arrested action of the skin or kidneys. It may also be due to obstructive disease of the lymphatics, as in leukæmia.

Divisions.—Dropsy may be localised or general. One form of localised dropsy is known as œdema. Œdema is an infiltration in the interstices of the connective tissue, confined to a part of the body or of an organ, *e.g.* œdema of the eyelids in Bright's disease, œdema of the feet in anæmia. Hydrothorax is a dropsy confined to the pleura; ascites to the peritoneum; hydrocephalus to the ventricles of the brain and arachnoid; hydrocele to the tunica vaginalis testis; myxœdema signifies a peculiar œdematous condition of the skin found in cretinoid women. Myxœdema is distinguished from œdema of Bright's disease by the absence of albumen in the urine, and by the softness of the skin, which is anæmic and waxy looking. Scleroderma is an œdema of the skin accompanied with induration.

General dropsy or anasarca is best exemplified in heart disease (valvular), and is then known as cardiac dropsy; in lung diseases obstructing the pulmonary circulation; in kidney diseases, then known as renal dropsy. In kidney diseases dropsy is due to changes in the secreting structures and poor state of the blood.

Dropsy may depend upon an obstacle to the circulation of blood in the heart and lungs. The obstacle leads to over-distension of the venous system and of the capillary vessels. During health there is a constant transmission of the serum of blood into the tissues, the quantity of serum so escaping depending upon the pressure within the vessels, the normal condition being kept up by the rapid absorption by the lymphatics. When the veins and capillary vessels become overloaded, the pressure within them increases. The lymphatics are unable to receive more fluid than their absorbent functions demand, and hence the fluid which is transmitted into the tissues is not taken up, and it accumulates and leads to dropsy. Anasarca often occurs in anæmic people, in wasting diseases, and is then due to watery blood, and to weak condition of the vessels.

General anasarca may also be due to the sudden action of cold and wet upon the skin, which by checking its excretion (perspiration) causes the blood to become more watery or produces diseases of the kidney. In this form the inflammatory exudation pours out into the loose surrounding texture. In rheumatism and gout œdema of the tissues round the joints occurs and is due to the same form of exudation.

Local dropsy.—Is generally due to mechanical causes, as obstruction to the venous circulation. In this condition, owing to some constriction, the vein becomes less pervious, the capillaries beyond become distended with blood, and, as explained in speaking of anasarca, there is dropsy. In cirrhosis of the liver there is portal dropsy owing to the impediment to the blood through the portal vein. Œdema confined to the head and neck and upper limbs is due to obstructions to the superior vena cava. Œdema of the inferior limbs occurs in ascites from the pressure of ascitic fluid on the inferior vena cava. Any local pressure on a special vein, as in pregnancy, may lead to œdema. Similar local dropsy is met with in hydrocephalus, in œdema of the larynx, and in œdema of the lungs. Local irritation may cause an appearance like œdema and due to effusion of serum into the subcutaneous tissue, easily confounded with acute dropsy when occurring in the face, as is sometimes the case in children with boils on the head. In lymphatic obstruction, as in cases of elephantiasis of the scrotum, we find the organ tense, elastic, and infiltrated with fluid.

Characters of the fluid.—It is thin and watery, of a very faint yellow colour, clear and transparent; specific gravity 1008 to 1012. It is generally alkaline. Chemically, it consists of water holding in solution large quantities of albumen, some chlorides, extractive matters, and sometimes crystals of cholesterine. It is allied to the serum of blood, but differs from it in being of a lower specific gravity, in containing more water and less of solid constituents.

Symptoms.—Objective.—In all cases at first the swelling appears slowly in the most dependent parts, in those which are most exposed, or where there is much loose areolar tissue. The affected part pits on pressure and the skin over it is tense, shining, and congested.

Subjective.—These are discomfort, uneasiness, and a feeling of tightness or distension over the affected part, owing to the accumulation of fluid, but no actual pain or tenderness. Sooner or later the dropsy by its pressure impedes the healthy action of the part.

Treatment.—Dropsy is only a symptom; its cause must be discovered and removed if possible. If due to impoverished blood, endeavours should be made to improve the general health. To promote absorption, the healthy action of the skin, liver, intestines or kidneys, should be maintained by diaphoretics, hydragogue purgatives, and diuretics. Among the diaphoretics one of the most effectual is the vapour bath. Various diuretics may also be tried. These are sweet spirits of nitre, squills, digitalis, or even copaiba and iodide of potassium. The natives of India use various drugs in such cases with marvellous effect. For the cure of dropsy purgatives should be used with very great caution. Very often patients are also suffering from diarrhœa. In such cases purgatives are dangerous weapons. In many cases improvement of the general health is followed by the disappearance of the dropsy. To obtain this purpose quinine, iron, strychnine, and cod-liver oil are highly beneficial. Locally rest, gentle pressure over the affected part, and elevated position, are of the first importance. If the quantity of the fluid be great it may be removed by paracentesis, as in the case of the thorax or abdomen, or by acupuncture or scarifications, as in anasarca. Great caution should be observed where puncture is necessary as sloughing is apt to ensue.

MYXŒDEMA.

The disease is characterised by a kind of solid œdema of the skin and connective tissue throughout the body. The tissue of the skin and the interstices of the connective tissue are found to contain excess of fibrillar elements and nuclei, thus resembling in structure the umbilical cord. They also contain mucin in large quantities. The disease is more often recognised in adult females than in males. The œdema may extend to the heart, liver, and other internal organs.

The characteristic symptoms are:—Translucent, pale, rough, and non-perspiring skin; that of the back and of the hand is sometimes scaly. The features are generally broad, and the expression is indicative of great despondency. The face is waxy looking, with a pink or bluish crimson patch on the cheeks. The eyelids are œdematous or boggy. The alæ nasi are thick and broad, the lower lip is large and pendulous, the hands and feet are puffy, large, and shiny. The œdematous parts are not affected by gravitation, and do not pit on pressure. The tongue and fauces are often swollen. The patients so affected exhibits feebleness of mind, inability to work, and general slowness of movements. The gait is tottering, the utterance is thick, slow, and imperfect, often monotonous. There is also slowness in answering questions; perception and memory are impaired. There is great irritability of temper, and the patients often attempt to do dastardly acts. They usually complain of sensations of cold, and their hands and feet are below the normal temperature. In some cases, the hairs over the pubes fall off, and the teeth degenerate and become brittle. There is no albuminuria at the commencement. The patient is generally drowsy. The disease has been known to set in with severe pain in both legs; the patient experiencing great discomfort, even after a slow walk, and her movements gradually becoming slow and deliberate. After a time, the face becomes puffy, and the eyelids swell, and the other symptoms above enumerated make their appearance. In far advanced cases the mucin-like cement pervades various glandular structures, and hence we find atrophy of the thyroid body, liver, and kidneys. The affection of the kidneys causes albumen to appear in the urine, and the quantity of urea is below the average. Albuminuria is not present in all cases. There is no true paralysis, and the tactile impressions are perfect; there is no abnormality as regards the sense of sight or hearing. The taste and smell may be somewhat altered. There is some evidence of heredity in connection with the disease; it has no apparent connection with syphilis. The idea that the condition is really Bright's disease without albuminuria is not supported by facts. Its pathological nature still awaits discovery. The disease lasts for years. Death occurs from uræmia or from some complication. In old chronic cases death may occur from general debility.

Fibroid Induration.

This is another important result of long-continued congestion or hyperæmia. At first there is a gradual increase in the connective tissue round the blood-vessels. The tissue gradually atrophies and undergoes retrogressive changes. The interstitial growth also leads to atrophy of other structures. As a result the whole organ ultimately suffers from impairment of function. The organ thus becomes hard and indurated, and also becomes pigmented owing to the excess of blood. This change occurs in the kidneys, and leads to compression of the uriniferous tubes; in the liver, where it causes obstruction to the portal circulation, and in the heart, where it produces diminution in motor power.

Thrombosis.

It is a coagulation of the blood within the vessels during life. It occurs as a result of mechanical hyperæmia or of changes in the walls of the vessel itself. Thrombosis may be found in the heart, arteries, capillaries, and veins. A distinction must be drawn between thrombi and coagula formed after death or in the last moments of life. Post-mortem coagula are soft, not adherent to the walls of the vessel, and are partly decolorised. They do not completely fill its cavity. Those formed just before death are firmer in consistence, more fibrinous, and generally paler than the post-mortem clots. These differ from a thrombus in the latter being firmer, dryer, and more fibrinous, and adherent to the walls of the vessels.

Thrombosis having once occurred the process continues to extend in the course of the vessel, and principally backwards from vessels of smaller calibre to those of larger size. Once formed the thrombus either becomes organised or undergoes a process of softening. The former change is more common in arteries, the latter in veins and in the heart. When organisation takes place connective tissue and vessels are formed, and these structures subsequently undergo a process of atrophy and contraction, and a fibro-cellular cord ultimately remains. Softening is another change which the thrombus may undergo. It generally commences at the point at which the thrombosis began, namely, in the centre of the coagulum, and gradually extends towards the circumference. The fibrin breaks up into a pulpy mass, sometimes of a yellowish and sometimes of a brownish colour. This change proceeds until the thrombus is completely broken up into granular matter, fat, and the débris of blood-corpuscles. Suppuration may likewise take place and the thrombus be converted into a mass of pus. Disintegration and suppuration may be going on in the interior while fresh layers are being deposited at the extremities of the thrombus.

With regard to the causes of thrombosis the process may be due to retardation of the flow of blood caused by interruption or narrowing of the vessel, solution of continuity of the vessel, dilatation of the vessels, or diminished power of the heart. It may also be caused by other abnormal conditions of the vessels or of the blood. The results of thrombosis are changes in the walls of the vessels, obstruction to the circulation, and embolism. Thrombosis in the femoral vein gives rise to a condition known as *phlegmasia alba dolens.* Embolism is the most important result of thrombosis. Emboli are generally portions of venous thrombi detached by the current of blood and carried into the circulation. The fragment passes into larger and larger veins, and at last into the right side of the heart, and thence into the pulmonary artery and its branches, in one of which it becomes arrested. It thus forms a plug, and by its means the supply of blood to a portion of the lung is cut off Emboli originating in the arteries generally become arrested in the spleen, kidneys, or brain; those formed in the tributaries of the vena portæ become arrested in the liver. The results of embolism are of two kinds, those due to the obstruction to the circulation and those produced by the irritating or infective properties of the embolic plugs. Results of the first kind occur in embolism of the brain leading to apoplexy, in embolism of the lungs, and of the coronary arteries. Hæmorrhagic infarction is a secondary result of embolism; it arises from the hyperæmic state of the vessels in the neighbourhood of the embolus. The metastatic abscesses of pyæmia are due, in part at least, to emboli. It has been proved that small portions of embolic pus can pass through the capillaries of the lungs and thence into the heart and general circulation, and become arrested in the spleen, liver, kidneys, and other parts, where they cause abscesses.

GANGRENE.

Gangrene is another result of mechanical hyperæmia. It occurs in cases where the obstruction is general and complete. There is an absolute and permanent arrest of nutrition. The arrest is circumscribed or confined to a part. It occurs more or less suddenly, the part generally retaining its external form and anatomical structure.

Causes.—These are mainly two: 1, those which interfere with the proper supply of blood, and 2, those which destroy the vitality of the tissues.

The proper supply of blood may be interfered with in the arteries, capillaries, veins, or in the heart. In the arteries the interference may be due to a ligature, to compression of a vessel, to solution of its continuity, to thrombosis or embolism, or to disease of its coats. In these cases the return of blood by the veins is not interfered with. As a result the gangrene is dry.

Gangrene is sometimes the result of obstruction in the capillaries. Obstruction may be due to pressure upon the capillaries or stretching of these vessels. The pressure may be caused by hæmorrhage, new growths, or by the accumulation of inflammatory products. As a consequence death of the immediately adjacent tissues takes place.

Moist gangrene occurs when the obstruction in the veins is associated with obstruction in the arteries. This is seen in a strangulated hernia, in invagination of the intestine, in constriction of a limb by a tight bandage, and in contusions in which both arteries and veins are injured.

The effect of the inflammatory process in impeding or arresting the circulation and impairing the vitality of the part affected and causing gangrene has been fully explained while treating of inflammation. Diminished power of the heart generally co-operates with other causes in producing gangrene.

In the second class of causes which produce gangrene are mechanical injuries, *e.g.* results of violence, heat, cold, &c., and poisons introduced into the circulation, as phosphorus and ergot of rye. Senile gangrene is due to atheromatous or calcareous changes in the vessels and diminished cardiac power. It occurs in parts which are distant from the heart. These shrivel into a black, cold, dry mass, and constitute a typical example of dry gangrene.

Conditions favorable to gangrene.—These are, exposure of the degenerated part to the oxygen of the air or to heat and moisture, and to various germs which promote putrefaction. Thus in disease of superficial parts, of portions of intestines or of lungs, gangrene is apt to occur rapidly, owing to the parts being exposed to oxygen. Moisture often promotes gangrene; this occurs in parts loaded with blood, as in congestion or dropsy, or where there is obstruction of veins. In the latter form the gangrene is known as moist gangrene.

Tissues less prone to gangrene.—These include hair, bone, teeth, elastic tissue, and cartilage. Some tissues, as fatty and albuminous matter, are, when decomposed, converted into carbonate of ammonia; others, again, into sulphuretted hydrogen, butyric acid, &c., which give them their fœtid odour.

Pathology.—In the early stage of gangrene the blood stagnates in the affected part, its colouring matter only escapes and permeates the vessels, and stains the tissues around. The veins thus appear as broad livid lines. The part also looks dark, owing to the deposit of hæmatin. The white corpuscles of the blood now become granular, undergo decomposition, and degenerate into granules of oil. The muscular tissue also degenerates and becomes granular. As the putrefactive changes progress, many low organisms make their appearance. These growths, known as bacteria, rapidly increase and multiply, and their presence hastens the rapid decomposition of the tissues under decay.

Condition of parts in gangrene.—The condition varies with the part affected. In the case of internal organs, *e. g.* the lungs, the tissue is changed into a bluish-green colour, it often looks black with congestion; it is fœtid and is abruptly limited, and surrounded by œdematous lung tissue. The part soon breaks down into a thick dark liquid mixed with débris. In the case of strangulated hernia, the part becomes black, putrefaction takes place very rapidly, and gases (fœtid) escape.

Mechanical Derangements.

Various tissues or organs of the body are subject to a variety of disturbances, known as mechanical or structural derangements. These include displacements of organs, compression, contractions, stricture, impaction, dilatations, and rupture.

Displacements.—Displacement of the heart and liver is best observed in cases of pleurisy with effusion (hydrothorax). Various displacements of the uterus are met with in every-day practice.

Compression, contraction, and impaction.—These derangements are best noticed in cases of tubular organs. By compression is implied pressure of a foreign body or a morbid growth upon the tube, which thus becomes narrowed and altered in shape. Contraction implies narrowing of the calibre of a tube, but the result is due to some morbid change in the tissues forming the wall, or to some imperfect action, whereby the tube contracts very forcibly. In either case stricture results. Impaction signifies the presence of a foreign body obstructing the passage of the contents of the tube.

Effects of compression.—These are best noticed in cirrhosis of the liver or lungs. The newly-formed fibrous tissue or interstitial growth presses upon the hepatic cells or the pulmonary alveoli, and leads to their destruction. In sclerosis of the brain and cord the same thing occurs. Bloody or serous effusions within the cranium or upon the heart or lungs, leading to serious consequences, are instances in point. Persons affected with goitre often suffer from compression of the trachea. In the case of aneurism of the aorta the sternum is often destroyed by compression. Cases of strangulation are also due to compression, *e.g.* strangulation of the intestines by bands of adhesions.

Contraction.—This mechanical derangement is of two kinds. In the one there is some growth, inflammatory or otherwise, causing obstruction. Thus, in endocarditis the affections of the valves, as warty growths and excrescences, lead to obstructive diseases of the heart. Stricture of the œsophagus, of the urino-genital organs, of the cardiac or the pyloric end of the stomach or of the intestines, chiefly near the anus, are instances in point. Another cause of contraction is spasmodic muscular action. Various spasmodic strictures are known to the physician. Laryngismus stridulus, spasm of the urethra, of the bronchi, as in asthma, of the cervix uteri, are cases of contraction due to spasm. In epileptiform convulsions the cerebral vessels contract spasmodically.

Impaction.—A foreign body becomes impacted in a tubular organ. Calcareous matter, concretions, hairs, &c., sometimes block up the calibre of a tube. In the vascular system, thrombi or clots cause obstruction. Emboli are detached portions of clots or vegetations from the heart, they are carried into the circulation and impacted in the capillaries, thus preventing circulation of blood in the vessels beyond. Renal calculi, gall-stones, indurated fæces, are frequent causes of impaction in the renal tubules, hepatic ducts, and intestinal tubes respectively. In bronchitis the bronchi very often become clogged with bronchial secretions, and suffocation ensues. Similarly, in acute Bright's disease, the uriniferous tubes are clogged up with epithelium, and by masses of fibrin, or by blood casts.

Dilatations.—Another mechanical derangement is dilatation. Dilatation of the œsophagus, stomach, and intestines takes place from want of tone or undue weakness of their walls. It also occurs whenever there is undue accumulation of their contents. Cysts are dilatations of cavities as existing in the body, or of tubes or ducts, or of alveolar spaces. They are often formed by extravasations of blood, and may originate in the softening and destruction of tissues. Among the dilatations of the cavities existing in the body may be enumerated those due to distension by dropsical or inflammatory exudations. Thus we find (hydrocephalus) dilatation of the cavity of the ventricles; hydrorrhachis, distension of the membranes of the cord; hydrocele, of the tunica vaginalis testis; hydrothorax, of the chest; ascites, of the peritoneum. Cysts may be formed by distension of ducts or by retention of the excretions.

In apoplexy, the extravasation of blood into the brain undergoes a series of degenerative changes, ending sometimes in the formation of a cyst in the central portion of the clot.

DERANGEMENT OF NUTRITION AND FUNCTION.

Derangements of nutrition are of several kinds. 1. Complete arrest; a condition followed by cessation of vitality and functions, constituting death. 2. Imperfect or deranged nutrition, known as atrophy and degenerations. 3. Increased nutrition, including hypertrophy and new formations.

ATROPHY.

Atrophy implies an excess of waste over tissue-growth. It is often attended with degeneration of the structure concerned. It is characterised as a partial arrest of nutrition, followed by diminution of the functional activity and weight of a tissue or an organ. There is diminution in size or in number of the histological elements of which the tissue is composed. Atrophy may be general and affect all the tissues of the body, or partial and confined to some particular part. Thus the feet of Chinese ladies are in a condition of artificial atrophy, due to the constant pressure of bandages. In India the Joghees practise, as an extreme mortification of the flesh, a habit of fastening their right arm round their head with a rope and keeping it so elevated throughout life; thus nutrition and circulation are partially cut off from it, and the arm becomes completely shrivelled up.

Varieties.—Atrophy is described as *simple* when the histological elements of a tissue or an organ are diminished in size, as *numerical* when their number is diminished. Generally both varieties co-exist. As a rule they are different stages of the same degenerative process. Cases, however, are met with of simple atrophy existing alone.

Simple atrophy.—This is best illustrated by cases of ordinary emaciation. In it the fat gradually disappears from the subcutaneous tissue, the fat cells lose their contents, which are often replaced by serous fluid. The cells are not destroyed and the cell-walls and the nuclei are distinctly visible. The glandular organs, as the liver, spleen, kidneys, mammæ, testicles, and lymphatic glands are subject to this kind of simple atrophy.

Numerical atrophy is a progressive stage of the above condition. In it some of the elements are diminished in size, as in simple atrophy. Others are actually destroyed and cease to exist as vital agents. Some pathologists designate numerical atrophy as necrobiosis, which must be distinguished from necrosis. In atrophy or necrobiosis the destruction or disintegration is of a molecular kind, or of the histological elements, whereas in necrosis tracts of tissue are at once destroyed. In necrobiosis the arrest of nutrition is slow and progressing. In necrosis the vitality is almost suddenly destroyed, the nutrition being completely arrested, but even after complete destruction the structure of the part can be recognised. Not so in cases of necrobiosis where the disintegrated tissue leaves little or no trace of its former structure.

General atrophy.—It is a form of simple atrophy affecting more or less all the parts of the body. It is also designated nervous atrophy, a term first used by Morton as implying a general wasting. Atrophy is said to be partial when limited to any particular part.

Causes.—Deficient nutrient supply. Whatever interferes with the proper supply of nutrition to the tissues may induce general atrophy. Thus, deficient food; stricture of œsophagus or pylorus preventing the passage of food: dyspepsia preventing assimilation and causing non-absorption of chyle; obstruction to the thoracic duct; diseases of the mesenteric glands (tabes mesenterica) may all cause general atrophy. 2. Excessive waste. Under various circumstances there is excessive loss of nutrient material and general atrophy is the result. Thus atrophy is common in menorrhagia and other similar discharges; in profuse and chronic suppurations, as occurs in empyema and in psoas abscess. In diarrhœa and in diabetes wasting occurs and is due to excessive discharge of serous fluid and of sugar respectively; excessive tissue-changes as in fevers lead to general wasting. 3. Impaired nutritive activity also leads to general atrophy. In senile atrophy this is the main cause of wasting.

In some cases general wasting occurs, and may be attributable to a variety of causes combined. Thus emaciation in phthisis is due to (1) excessive drain or loss of nutrition consequent upon profuse expectoration, profuse sweats, and diarrhœa; (2) to deficient supply of nutrition owing to imperfect oxidation of blood, and to interference with assimilation caused by structural changes in the stomach and intestines; and (3) to increased tissue-changes. In febrile diseases wasting of the body is also the result of a combination of two or more conditions. Thus it may be caused by (1) increased tissue-change, (2) loss of appetite, and (3) defective assimilation.

Partial atrophy may be due to *diminished* or *imperfect supply of blood* to a part. The nutrient vessels of a part or an organ may be obstructed by pressure upon them from within or from without. Thus, in cirrhosis of the liver the new growth of interlobular tissue presses upon the vessels, the blood-supply becomes diminished, and as a result the secreting structures atrophy. In thoracic aneurism the direct pressure on the sternum or vertebræ diminishes their nutrition and causes atrophy. Atrophy of the kidney from pressure of retained secretion—as sometimes occurs where there is any obstacle to the escape of urine—is an example of this nature.

2. *Diminished functional activity* gives rise to atrophy. Those parts which are no longer required to serve any purpose in the economy gradually atrophy and waste—the ductus arteriosus, umbilical arteries and vein, Woolffian bodies, and later on the thymus gland, the involution of the uterus after delivery, muscles in infantile spinal paralysis, limbs in anchylosis, the lower part of the bowels in cases of stricture, the mammæ in old women, all these are instances of this kind. In essential paralysis we observe wasting of muscles owing to want of use or to diminished functional activity. In exceptional cases increased activity leads to atrophy, *e.g.* the testicle is said to become atrophied from excessive use.

3. *Certain substances*, as iodine, mercury, bromine, lead, and alkalies, tend to produce atrophy. Thus, iodine and mercury cause atrophy of the glands, bromides, of the generative organs, and breasts.

4. *Chronic inflammations.*—In this condition a new growth of fibroid tissue (degenerations) presses upon the minute structures of the organ, and causes impairment of their nutrition and vitality, and thus leads to atrophy, *e.g.* cirrhosis of the liver.

5. *Defective nerve supply*, as best seen in paralysed limbs.

Physical characters.—The atrophied part loses in weight and size. It contains less blood, is drier, more firm and fibrous in texture, and its functions are reduced; in case of bones, only the absolute weight is diminished, but not always the size. In them there are two varieties of atrophy, known as *concentric* and *eccentric.* In the *concentric* variety the compact and cancellous tissue becomes absorbed, the medullary canal diminishes in size, and the whole bone becomes smaller; in the *eccentric* atrophy no diminution in size of the bone takes place, there is merely conversion of compact into cancellous tissue, the whole bone becomes rarified, light, and brittle. This occcurs in old age without disease. When an organ is atrophied the whole of the textures more or less suffer. The fibrous constituents are the last to atrophy, hence the atrophied part is firm and tough. In atrophy of glandular organs the cells become smaller and finely granular. In the case of muscles the primary fasciculi waste at first, then the transverse striæ disappear, and lastly, all the contents of the sarcolemma are removed, leaving only the connective tissue.

HYPERTROPHY.

Hypertrophy is an abnormal increase in the size or number of the histological elements of a part or organ. In hypertrophy the chief histological elements upon which the functional activity depends are the constituents generally involved. The increase of tissue elements may be from the enlargement of those previously existing, or from the deposit of new ones from without. Thus hypertrophy of the unstriped muscular fibres of the womb during pregnancy is an example of enlargement of the previously existing elements, or of true hypertrophy. Cases of enlargement of the liver, due to fatty deposit or to waxy degeneration consequent on infiltration, of swelled testicle from the deposit of tubercle or cancer, or of the lymphatic glands infiltrated with cancerous matter are not examples of hypertrophy, as they are caused by a deposit of extraneous matter or by the development of inflammatory or other morbid growths. In the latter class of cases the normal structure of the organ or tissue is atrophied or degenerated. Hypertrophy is termed simple when the enlargement is owing to an increase in the size of the previously existing elements; when new tissue is formed the term numerical hypertrophy or hyperplasia is used.

Causes.—1. Increase in the blood of those materials which are necessary for the nutrition or secretion of a tissue or an organ. 2. Increased quantity of healthy blood in a part. 3. Increased functional activity of a tissue or an organ, owing to its being called upon to do extra work. Thus, in stricture of the pylorus and of the urethra, the stomach and the bladder respectively become hypertrophied. In cases of congestion of the lung and of valvular disease obstructing the flow of blood through the heart, hypertrophy of the organ results.

Elephantiasis of the leg is a hypertrophy due to excessive supply of nourishment owing to obstruction and dilatation of its lymphatics.

Other examples of hypertrophy due to functional activity are also met with. Thus, as a result of exercise,—in the cuticle of a labourer's hand, in the calves of ballet-dancers, in a blacksmith's arm. In cases of disease of one kidney or of one lung the other healthy kidney or the lung becomes hypertrophied, in order to remove from the blood the urea or carbonic acid which is not removed by the diseased organ. Local pressure alternately applied and removed gives rise to hypertrophy, *e.g.* corns from ill-fitting boots.

Treatment.—The object to be aimed at in cases of simple atrophy is the restoration of the wasted tissue to its original condition. This, in general terms, is to be effected by supplying nutritive material and checking waste. In atrophy from disease, as of the muscles, we may increase their nutrition by stimulating their activity, and the latter object may be effected by friction and the careful employment of electricity. Numerical atrophy is a condition of very serious import; in it repair can be effected only by new formation. The treatment of hypertrophy will be described in the special chapters on diseases complicated by this condition.

DEGENERATION.

Degeneration or decay means degradation of tissue, and is a substitution in the body of a lower for a higher form of structure. It is characterised by alteration in the quality of the tissues, rather than by a quantitative change. It is attended by diminution in the nutrition, by the impairment of function, and by a more or less complete destruction of the original elements. In this process the elementary constituents of the tissues of the affected part become gradually destroyed, their place being taken by granular matter, fat, or pigment. These abnormal matters are said to be due to decomposition of the normal tissues and to the deposit in them of insoluble constituents from the blood. Degeneration may result from a direct metamorphosis into a new material, or from infiltration with some abnormal matters deposited from the blood.

Metamorphosis.—In this condition the albuminoid constituents of the tissue are converted into a new material, the original tissue-elements are destroyed, the intercellular substance softened down, all trace of the structure lost, and its function completely arrested. This is best seen in voluntary muscles, in the muscular fibres of the heart and blood-vessels, in nerve tissues, in softening of the brain and spinal cord, and in bones, liver, and kidneys. The changes are of three kinds, viz. *fatty*, *colloid*, and *mucoid* degenerations, or metamorphoses.

Infiltration.—In this form of degeneration the tissues are not altered, the original elements remain, there is a deposit from the blood of a new material. There is no softening of the intercellular substance. The vitality is interfered with and function impaired. The infiltrations include fatty, amyloid, calcareous, and pigmentary degenerations.

Fatty degeneration.—The accumulation of fat occurs under different circumstances and under different pathological conditions.

Sources of fat in the body.—The oleaginous, saccharine, and albuminous constituents of food, are the sources whence the fat is derived. This fat is generally useful as a hydro-carbonacous heat-producer, and as a producer of force. It is removed by a process of oxidation. Where the oxidation is incomplete the fat is not removed, but accumulates in cells of adipose tissue and in those of the liver for future utilisation.

The saccharine and albuminous principles which are useful for the process of nutrition also undergo decomposition and produce fat. Where the accumulation takes place in the cells of the connective tissue, obesity is the result. The existence of fat in situations where it normally does not exist constitutes a morbid process or a condition known as fatty degeneration. Accumulation of fat takes place under different circumstances. Thus where the oxidation is incomplete from any cause, the excess of fat, or the normal quantity of fat, or the fat which may result from the saccharine and albuminous principles, or is necessary for nutrition, accumulates in the body. Similar accumulation due to imperfect oxidation takes place when the fat is liberated from the protoplasm of cells during the process of nutrition.

Fat accumulates under different pathological conditions. The incomplete oxidation may be due to disproportion in the blood between the oxygen and oxidisable materials. It is generally believed that the red corpuscles are the carriers of oxygen, and in cases where the supply of blood becomes diminished or interfered with, these become fewer, or defective in quality, and consequently incomplete oxidation occurs, and fatty degeneration is the result. Thus emboli or thrombi by diminishing the supply of blood to a part, diminish the oxidation, and lead to softening or fatty degeneration. In poisoning by phosphorus, lead (wrist-drop), and other substances red blood cells are destroyed. In general anæmia due to many chronic and acute diseases (lungs and heart); in old age owing to great inactivity of the circulation; in paralysis where the muscles are for a long time disused; and in the case of various organs and tissues which may be long out of use, the quantity of blood circulating in them becomes less, and fatty degeneration is a frequent result.

Fatty degeneration is extremely common in cases of chronic diseases of the lungs, where the oxidation is generally incomplete.

Fatty metamorphosis.—It is a pathological process. In it the fat makes its appearance as minute granules or molecules which are the products of decomposition of protoplasm, and they collect round the nucleus. These granules gradually increase in number, coalesce, and so form drops of fat. The protoplasm undergoes complete change. In this process the cells become larger and more globular in shape. The nucleus and cell wall are destroyed, and nothing but the granular fat is left. Ultimately the albuminous matter between the granules liquefies, the corpuscles are destroyed, and the whole becomes a mass of detritus which consists of cholesterine, broken-up tissue, and oil. This kind of metamorphosis is often noticed as a physiological phenomenon. The secretion of milk, the sebaceous matter of the skin, the cerumen of the ear, and the corpus luteum of the ovary are examples of fatty metamorphosis in which a continuous formation and destruction of cells take place. In inflammatory processes, the epithelial cells, the connective tissue cells, and even pus cells undergo degeneration and form granular cells.

Characters of fatty metamorphosis.—The affected part is pale, yellowish in colour, and opaque; its elasticity and power of resistance are impaired or lost; and its functions are impaired.

Terminations.—Under favorable circumstances the degenerated products get absorbed. This is best seen in cases of absorption of the inflammatory products of croupous pneumonia. Absorption chiefly occurs in places where the tissue is copiously supplied with blood-vessels. Where the metamorphosis is not complete the affected part becomes dry by the fluid becoming absorbed, or it is converted into a cheesy mass; thus the degenerated tissues, instead of consisting of fat cells, now contain withered cells, fat granules, and crystals of cholesterine. This change is known as *caseation*, or caseous or cheesy metamorphosis, and is best seen in scrofulous lymphatic glands and in inflammatory products in the lungs.

Caseation.—In this termination the fatty degenerative products gradually dry up and form a yellowish friable material resembling soft cheese. This condition is due to the deficient supply of blood to the part, which therefore becomes dry. It is most frequently noticed in parts which have become obliterated by some new growth. Thus in consumption of the lung, the closely crowded cells become obliterated owing to their accumulation. Similar caseation takes place in the lymphatic glands and in the brain. As a further process the degenerated caseous mass sometimes undergoes softening and liquefaction. Certain chemical changes take place in its constituents. Exposure to the air induces these changes, thus softening is common in degenerations in the intestines, lungs, and in the bronchial mucous membrane. When the caseous mass liquefies it forms a thin curd-like fluid consisting of granular debris, fat, and cholesterine. Very often this liquefied matter is not discharged and may dry up and calcify. Caseous masses are also prone to become calcified, without previous liquefaction.

Fatty infiltration.—In this degeneration fat is deposited within the cells as oil-drops. They collect together and displace the protoplasm and the nucleus. The cell thus becomes distended with oil, and the protoplasm and nucleus become invisible. The vitality and function of the cells are not much affected, the cell wall not being destroyed. As a physiological process it is best seen in the liver during digestion of fatty food, and in corpulent people. As a morbid or pathological process fatty infiltration may be seen in—

(*a*) *Muscles.*—The deposit takes place in the connective tissue round the fasciculi of the muscle. This is best observed in animals which are fattened. In paralysis and in anchylosis of a joint, the muscles, owing to want of use, and in which oxidation processes are considerably reduced, are the seat of this kind of growth. The same may be met with in the extensor muscles of persons suffering from wrist-drop due to the poison of lead. In progressive muscular atrophy, the same kind of infiltration has been noticed.

(*b*) *Heart.*—During health a varying amount of fat covers the surface of the heart, it is most abundant in the grooves between the auricles and ventricles, and where it surrounds the large blood-vessels. When the deposit becomes considerable the walls look like a mass of fat. The fat compresses the muscular fibres, and thus interferes with the function of the organ. The pressure ultimately leads to degeneration or fatty metamorphosis.

(*c*) *Liver.*—During health the hepatic cells contain a small quantity of fat which is increased by ingestion of fatty food. The excess is at first found in the portal blood, whence it is deposited in the hepatic cells close to the capillaries of the portal vein or in the cells at the circumference of the hepatic lobules. From the circumference it is conveyed into the interior, and ultimately conveyed again into the circulation. This process is temporary and purely physiological, and does not interfere with the vitality or function of the cells.

As a pathological process fatty liver is known as a diseased condition. In it there is an abnormal quantity of fat deposited from the blood in the portal capillaries and in the cells at the circumference of the hepatic lobules, and the deposit increases and leads to their distension, the cells assuming a globular form. As the case progresses the other cells in the interior become similarly distended and the whole of the liver becomes degenerated by fatty infiltration. This process does not at first interfere with the vitality and function of the cells which continue to secrete bile.

All those conditions which are least favourable to oxidation give rise to the accumulation of fat in the body and particularly in the liver. In the liver these conditions are most rife. Thus in it there is; 1. Excess of non-nitrogenous oxidisable matter; 2. The deoxidised condition of portal blood. 3. Slowness of circulation in the portal vessels.

In cases of emaciation fat often accumulates in the liver. This is due to impairment of the oxygenating power of the blood. As an opposite condition in fat persons the liver participates with other organs. Fatty liver is common in chronic lung-diseases, owing to the imperfect oxygenation of blood due to destruction of the lung-tissue.

Mucoid and colloid degeneration.—It is a class of morbid changes characterised by a peculiar softening of the tissues. It is called mucoid when the intercellular substance is the seat of degeneration, and colloid when the cells are affected. In a majority of cases of degeneration both these changes are combined.

Mucoid.—In it the albuminous constituents of the tissues are converted into mucin, a soft jelly-like material. In the normal condition, the umbilical cord and the vitreous humour of the eye, consist of this mucin-yielding substance. In mucoid degeneration the intercellular substance of the connective tissue, which is chiefly composed of gelatine and chondrine, is transformed into mucin, the original structure being destroyed. Mucin does not contain sulphur; in other respects it resembles albumen, being like it soluble in free alkalies, and precipitated by dilute acetic acid. Unlike albumen it is insoluble in excess of acid, and is not precipitated by boiling, by tannin, or by perchloride of mercury. This change is seen in the costal cartilages and intervertebral substance in old people, and in serous membranes and new formations.

Colloid degeneration.—The albuminous constituents of tissue cells are converted into a glue-like substance, the original structure being destroyed. It differs from mucin in containing sulphur and in not being precipitated on the addition of acetic acid. This degeneration is seen in enlargement of the thyroid gland, of the lymphatic glands, in the choroid plexus, and in various new growths.

Amyloid, lardaceous, or waxy degeneration or infiltration is also known as bacony, albuminoid, or scrofulous degeneration. It consists in the deposit from the blood of a new material, albuminoid in its character and which infiltrates the various tissues or organs of the body synchronously. The cells and intercellular spaces gradually become distended with the deposit. This degeneration often follows prolonged suppuration, during which process a large quantity of alkali is withdrawn from the blood. It is rarely a primary affection, but occurs as a sequel of cachexia, of many exhausting diseases, of long-continued suppuration, as in chronic diseases of the bones. It also occurs in purpura hæmorrhagica, in empyema, and chronic lung diseases; in chronic kidney-diseases; in chronic intestinal ulcerations; and in chronic syphilitic bone-diseases.

Chemical test.—It is supposed to be a de-alkalised fibrin or a nitrogenous substance resembling albumen. It resists the action of digestive fluids, as pepsine, and hence can be obtained in a free state. It is deficient in potash and phosphoric acid, and yields excess of soda and chlorine. It gives a peculiar reaction with iodine, and with iodine and sulphuric acid. Iodine solution changes it to a deep reddish-brown or mahogany colour, which soon fades away. Iodine and sulphuric acid give a blackish, blue, or violet tint. In this degeneration the vitality of the tissues affected is impaired and their functions diminished. The organs mostly affected are the kidneys, liver, spleen, lymphatic glands and the intestines. It is rarely confined to one organ. When the degeneration is established, several tissues or organs are found to have become involved in the morbid changes.

This infiltration or amyloid deposit commences at first in the cells of the muscular coat of small arteries and their capillaries, it then attacks the surrounding tissue and intercellular substance, and, lastly, extends to the whole organ. The circulation in the organ becomes impeded, the arteries diminish in calibre and their cells increase in size, their nuclei disappear, and they coalesce and form a homogeneous mass. The pressure exercised by the infiltrated substance upon the organ leads to further impairment of its nutrition and its function.

Condition of the organ.—The organ is increased in size and absolute weight, and specific gravity ; its surface is smooth, its capsule tense and stretched. In consistence it is very firm ; it is pale in colour and translucent. On section it has a homogeneous waxy appearance, owing to the diminished calibre of the blood-vessels. The degeneration sometimes exists in the villi of the intestines and in the mesenteric glands. The so-called corpora amylacea are not examples of amyloid degeneration.

Results of amyloid degeneration.—The affected organ or the tissue loses its normal vitality and function. This effect may be due to the obstruction offered to the normal circulation and to the mechanical effect produced by the presence, or to the influence of the new material upon the substance of the organ. The obstruction to the circulation may be due to (*a*) the narrowing of the calibre of the arteries, (*b*) to the general pressure of the amyloid substance. The obstruction often leads to subsequent atrophy and fatty degeneration. It is thus that we frequently notice in cases of amyloid changes, that they are associated with other degenerations. The vitality is impaired, and this is owing to the infiltration of the cell-elements with the deposit. The function is also deranged.

Calcareous degeneration.—It is an infiltration of the tissues with calcareous particles. This change occurs in two forms. As a physiological process lime and magnesian salts are deposited in the cartilaginous structure of bones. In the bone, owing to the nutritive activity of the tissue, the saline particles are not visible. As a pathological deposit it is a mere infiltration, there is neither increased activity of the part, nor any change of structure. In disease the deposition occurs under two opposite conditions. The salts are absolutely increased in the blood, and are deposited in the tissues, as in mollities ossium. In it the infiltration is general, the salts are removed from the bones, returned into the blood and deposited in various tissues or organs. Thus, the calcareous deposit is found to invade lungs, kidneys, stomach, and intestines simultaneously. The disease commences in the tissues around the blood vessels, and then extends to other parts.

The second variety is very common. It is one in which calcification depends upon some change in the tissues themselves, without any absolute increase of the salts in the blood. In this condition, owing to changes in the tissues, the salines which are kept in solution in the blood are precipitated and deposited in the tissues. In inflammation, in cases of diminished nutritive supply, and where the vitality is impaired, this kind of degeneration occurs. As a result of tissue-change, atrophic and other degenerations are often followed by calcification. In consumption of the lung, in atheroma of the arteries, in caseation of the lymphatic glands, and in the cartilages in old people calcification often occurs.

Cause.—In either variety the deposition is supposed to be due to the action of some acid in the blood, whether the acid be carbonic or lactic acid is not quite clear. Rindfleisch asserts that there is stagnation of blood in the atrophied or degenerated part, owing to which the free carbonic acid, which keeps the salts in solution in the blood, escapes, and the calcareous particles are thus precipitated. Owing also to the degenerated condition of tissues, the assimilation of the nutritive fluids is interrupted, and the salts are precipitated. On section the calcified mass is hard, brittle, rigid and gritty to the touch. The particles appear both within the cells and in the intercellular substance. They are opaque, of a dark-black colour, and of an irregular outline. They consist of the phosphates and carbonates of lime and magnesia. They are soluble in dilute hydrochloric acid.

Unlike fatty degeneration, calcification undergoes no further change, but the degeneration remains as an inert mass, without any vitality. The structure of the tissue involved is not destroyed; it can often be recognised after the calcareous particles have been dissolved out by a dilute acid. The degeneration occurs chiefly in the middle coat of arteries and in capillaries, in the tendons, cartilages, and in the skin. It is a constant deposit in old morbid inflammatory products, as false membranes, which occupy the pleuræ or the pericardium; tubercles, pus, and clots, are also subject to these deposits.

Pigmentary degeneration.—It consists of an abnormal deposit of pigment in the tissues. The pigment is derived from the blood, its colouring matter undergoes certain chemical changes and is converted into pigment. It is often eliminated by the urine and bile. When the skin is bruised, pigmentation occurs, the blood-corpuscles lose their hæmoglobin, either by exudation or destruction of the corpuscle, and the colouring matter mixing with liquor sanguinis diffuses into the surrounding tissues and stains them, the granular pigment being precipitated among the tissues, and forming small nodules. What is termed "false pigmentation" occurs when bile is prevented from being excreted; it stains the tissues, but no pigment deposit takes place. In Addison's disease the cells of the rete mucosum are filled with granular brown or black pigment. In various skin diseases, and cutaneous inflammations caused by acids or irritants, the development of pigment is a common result of extravasation of blood. During congestion this escape of corpuscles takes place either by the rupture of capillaries or emigration through their walls. Thus the tissues, the cells, and even the intercellular substance, all become infiltrated with colouring matter from the blood, conversion into pigment being a subsequent process.

Further changes.—Pigment exists mostly in cells and intercellular substance. After a time the pigment becomes darker and more granular, and crystals appear in the cells and intercellular tissue. It is then known as hæmatoidin. The latter resembles the colouring matter of bile. With mineral acids it displays varieties of colours. It is insoluble in water and alcohol, and soluble in the caustic alkalies which give it a red colour. It contains more carbon than hæmoglobin. Pigmental degeneration has very little influence upon the vitality and function of the affected tissue or organ. Pathologically, hæmatoidin is to be regarded as an evidence of previous extravasation. In the brain the crystals may be all that remains of the blood escaped from the cerebral capillaries. Similar condition of the mucous membrane of the stomach and intestine may be found as a result of previous congestion and extravasation. Pigmentation is mostly found in the lungs.

Another form of pigmentation of the tissues occurs, but it is not due to the presence of hæmatoidin. The yellow stain affecting almost all the tissues in jaundice is due to the presence of the colouring matter of the bile. Another kind of discoloration is caused by the long-continued use of nitrate of silver. The dark colour in gangrene is due to the action of the sulphuretted hydrogen upon the colouring matter of the blood. Pigmentation of the lungs is often due to the presence of minute particles of carbon inhaled with the air. Other substances, as coal, stone, and iron produce the same appearances.

MORBID GROWTHS.

Morbid growths or tumours are distinguished from inflammatory swellings by the circumstances which attend their origin, by their power of growth, and by their structural organisation. A tumour is a new formation which attains a certain size, and then either remains permanent or tends continually to increase. It is independent of the rest of the body, and increases in size by virtue of its own inherent activity. An inflammatory new growth, on the other hand, is due to some irritation, its formation and development proceed in a uniform manner, it is liable to undergo absorption, and also to become organised and developed into connective tissue. No physiological object is gained in the new formation of tissue which constitutes a tumour.

Tumours have been divided into two great classes, named respectively malignant and non-malignant. The term "malignancy" is now used in a purely *clinical* sense, and signifies the property possessed by many tumours of reproducing themselves after removal either locally or in distant organs or tissues. Cancerous growths are thus styled malignant, but other tumours, notably the sarcomata, possess a similar capacity for reproduction. The term "cancer" is now used to imply a definite kind of structure, it is therefore an *anatomical* term.

Causation of tumours.—Many theories have been advanced on this subject; very little, however, is definitely known. Local irritation plays a certain part in the causation of primary tumours, as is evidenced by the fact that they occur most frequently in parts of the body most exposed to sources of irritation. Thus statistics show that the stomach, the uterus, the face and lips, the breast, and the intestines are the most frequent seats of tumours. It is necessary, however, to assume the existence of a specific predisposition of the part in certain individuals. Places which have been the seat of inflammatory disease, in consequence of which the part has become weakened, and also scars, serve as foci for the development of tumours. Organs which acquire their full growth and development in later life, *e.g.* the breast, the uterus, the ovaries, the testicles, are known to be peculiarly liable to the development of tumours.

With regard to constitutional causes of tumours, it is the malignant growths which are supposed to be due to the existence of a general constitutional taint. The cancerous tumours have been regarded as the local manifestation of a constitutional dyscrasia. This hypothesis is based on the following grounds:—1. The diffusion of the morbid growths throughout the body. 2. Their occasional commencement in several primary tumours simultaneously. 3. Their capacity for growth in various textures. 4. Their tendency after removal to recur both locally and in other parts of the body. 5. Their tendency to hereditary transmission.

According to another theory cancer is a local disorder and independent of a constitutional cause. This theory is based on the following grounds:—1. Its invariable origin as a single tumour. 2. The dependence of the later tumours upon the first. 3. Its inheritance as a local and not a constitutional peculiarity. 4. Its preference for persons apparently healthy.

It is doubtful whether the appearance of cancer is preceded by any definite cachexia. In the majority of cases there is no evidence of ill health. After the growth has appeared, however, various symptoms of constitutional derangement are apt sooner or later to show themselves; the patient becomes anæmic in consequence of disturbances of digestion, deficient nutrition, and perhaps hæmorrhages. Emaciation, pallor, or discoloration of the skin are other symptoms, but there is nothing in these appearances that is peculiar to cancer. The so-called "cancerous cachexia" becomes developed in direct proportion to the extent and situation of the local lesions.

Tumours may be classified in various ways. The most recent classification is based on the histological characters of the growths. The new formations on the type of the epithelial tissue include the cancers; those on the type of embryonal connective tissue, sarcoma and myxoma; those on the type of normal connective tissue, fibroma, myoma, lipoma, chondroma, and osteoma. The new formations on the type of higher forms of tissue include papilloma, angioma, neuroma, and adenoma.

Many of these growths being situated on parts of the body that are within reach of the surgeon, belong to the province of surgery, and these require only a passing notice in the present work. Those which come more especially under the notice and care of the physician will be described more minutely. Of these the most important are the carcinomata.

CANCER.

Cancer is a deposit which is prone to unlimited increase into the surrounding structures, and in the course of the lymphatics of the part affected. The meaning of the terms "cancerous" and "malignant" has been already explained. After removal malignant growths are apt to recur in the original spot and also in remote parts of the body. They are capable of multiplicity, and difficult of spontaneous arrest or cure. They always infiltrate tissues, and disseminate through the lymphatics and veins. Some of them, owing to abundance and rapidity of cell growths, are soft and juicy. Some are also highly vascular. All of them are supposed to be associated with vitiated condition of the blood or dyscrasia. Their development is preceded or accompanied by a cachectic state.

Peculiarities and structure.—Malignant growths vary in consistence. They may be hard and dense, or soft and brain-like. They are developed in a tissue, which they do not at all resemble. They are heterologous or distinct from the normal elements of the part. They are liable to undergo fatty degeneration, also caseous, calcareous, and mucoid changes. Frequently hæmorrhages occur. They consist of an abnormal fibrous framework, of fluid contents and of groups of cells of an epithelial type of various sizes, often large, distorted, and crowded together. The cells are embedded within the framework, and surround arteries and veins. They are polymorphous, often round or oval, but more frequently irregular in form. They contain one or more nuclei, which are large and prominent, and round or oval in shape, and contain one or more nucleoli.

Varieties.—The encephaloid is the most malignant, the epithelioma is the least so. The varieties are:—1. Scirrhus, fibrous, or hard cancer. 2. Colloid or gelatiniform (alveolar). 3. Encephaloid, or brain-like (medullary) cancer. And 4. Epithelioma or cancroid cancer. This division depends upon the proportion of stroma and the type of cells in each case. When the cancer includes bony structure it is known as osteo-sarcoma; when it displays itself upon the skin it is called epithelioma; when it ulcerates, is covered with fungoid granulations, and is attended with hæmorrhage, it is known as fungus hæmatodes. When the encephaloid cancer contains much pigment deposit it is called melanotic.

Causes.—They have been supposed to owe their origin to the existence of a taint in the constitution. In a majority of cases, however, there is no history of such a taint. The patient is healthy up to the time of the appearance of the growth, the cachexia then sets in secondarily, and is in proportion to the extent and situation of the mischief. Multiplicity of the growth, which is a common phenomenon in cancer, is in all probability a result of infection from the primary growth rather than due to the existence of a general cachexia. Multiplicity generally denotes a local rather than a constitutional disorder. Similarly the recurrence may be due to the incomplete removal of the growth. Proliferating elements must be often left behind in the surrounding tissues, it being very difficult to distinguish infiltrated tissue from a healthy one. The same explanation holds good with regard to the development of cancer in the internal organs and the lymphatic glands. In both the agency of infection comes into play.

The disturbance in the blood which is associated with the development of morbid growths may be due to (1) the absorption of deleterious substances; (2) the entrance into it of the cancer element; (3) the drain of the discharges and the interference with various nutritive processes.

Cancer is often hereditary. Heredity points to the existence of a local rather than of a constitutional taint. Another cause is direct irritation. This may be chemical or mechanical. The effect of direct irritation is most marked on tissues or organs which are the most exposed to these influences, *e.g.* epithelioma on the lips of those who are inveterate smokers, the chimney sweepers' cancer on the scrotum and penis is due to direct irritation of the soot. Owing to a similar liability cancer is most common in the tongue, stomach, uterus, mammæ, and rectum.

Development of cancer.—It is a product of pre-existing cellular elements, the source whence the new cells are derived being either the epithelial cells or the cells of connective tissue. In cancer the new growth is heterologous, and does not resemble the tissue from which it originates. It also differs from the tissue in which it is situated. Heterology is thus an evidence of cancer.

The relation of cancer to the surrounding tissue consists in the growth of cancer cells taking place at the circumference by the proliferation of the cells into the adjacent tissue. This being the case it is extremely common for malignant growths to recur even after their removal. These growths have also a marked tendency to invade other structures.

Termination. — These growths rapidly undergo degenerative changes, the cells are very unstable and soon perish.

Characteristic features of malignant growths.—These are three: 1. Invasion of the adjacent structures. 2. Implication of the nearest lymphatic glands. 3. Reproduction of the growth in distant tissues. As a rule, it can safely be surmised that among malignant growths those which contain most juice and are rich in blood-vessels and lymphatics will most rapidly infect the lymphatic glands and internal organs.

Cancers generally consist of epithelial cells and abnormal fibrous tissue. The cancer cells are generally found to be grouped together within the alveoli of a dense fibrous tissue, and have no intercellular substance. The milky juice which exudes from the cut surface of a cancer is the liquid which exists between the cancer cells.

Scirrhus, fibrous, or hard cancer.—It is a primary growth, and is fibrous or hard like cartilage, and exhibits a tendency to draw into itself the neighbouring soft structures. It never attains a large size, is irregular in shape and its growth is slow. The tumour is depressed, and there is puckering of overlying structures; it consists of abnormal fibrous tissue, disposed so as to form alveoli, very little fluid contents, and the epithelioid cells. On *section* it produces a creaking sound. The surface is bluish white, glistening, and opaque, with fibrous bands intersecting it. Is not very vascular, and on scraping it a little milky juice oozes out. It chiefly affects the mammæ, stomach, and intestines. The neighbouring glands are not rapidly affected. The cellular elements are prone to undergo degenerative changes.

Colloid, *alveolar*, or *gelatinous cancer.*—It sometimes forms irregular lobulated masses; consists of loose fibrous tissue, arranged as matrix, which has a spherical alveolar structure; the alveoli communicating freely with one another. On section these reddish spaces or alveoli are seen to contain an abundance of a glue-like, colourless, or more or less yellowish substance, and a variable number of epithelioid cells. The cells contain material similar to that in which they are embedded. Chief seat, stomach and rectum.

This variety has a tendency to spread into the neighbouring tissue. Thus, when affecting the peritoneum it spreads over a large area, and even affects the stomach or intestinal walls.

Encephaloid, *medullary*, or *soft cancer*, is lobulated, of irregular consistence, and increases rapidly; its substance is soft and brain-like; it consists of numerous multiform cells with little stroma, arranged as a matrix, which is also soft and vascular, and contains a peculiar fluid in large quantities. It develops rapidly, is highly vascular, degenerates speedily, and becomes granular, the nuclei being set free. If removed it is rapidly reproduced. On *section* it appears white, somewhat vascular, soft and pulpy in the centre, studded here and there with extravasations of blood, and when pressed a large quantity of juice oozes out. It is most frequent as a secondary growth; as a primary growth it occurs in the testicle, the prostate gland, and the eye. It chiefly affects the liver, kidneys, and lungs. When more than usually vascular it is known as fungus hæmatodes. It rapidly involves the neighbouring glands.

Epithelioma or *cancroid* is a cancer originating in the epithelial tissue, and consists of epithelium-cells originating in cavities of considerable size. It occurs in connection either with the skin or the mucous membrane where it joins the skin. It commences at first either as a hard nodular swelling or a tumour, which soon becomes a small ulcer. The ulcer presents irregular and indurated edges; its surface is often covered with blood. It is firm, but very friable if touched, and consists of a number of large epithelial cells and nuclei altered in shape by being mutually pressed together. The large cells occupy the centre, the younger ones lie at the periphery. Many of these cells are arranged in peculiar concentric globes or nests with a flattened outline. On *section* the mass presents specks and white lines of fibrous tissue. On pressure a small quantity of milky juice or a granular fluid exudes.

Melanosis is an encephaloid cancer with much pigment deposit; consists of a fibrous stroma, and cells varying greatly in number, size, and shape. The cells are of large size, of various forms, and contain one or more nuclei and nucleoli, with here and there traces of fat molecules. On pressure a juice comes out, which contains numerous giant cells, nuclei, and granules. Cancer of the heart is usually melanotic. The majority of the soft melanomata belong, however, to the sarcomatous class of tumours.

Sarcomata.—They are formed of embryonic connective tissue. Different growths are named according to the size and configuration of the cells. The cells consist of masses of nucleated protoplasm without any limiting membrane. The intercellular substance is met with in every growth. The cells vary in form; some are rounded, others fusiform, and in a third variety the cells are named myeloid or mother cells. The blood-vessels are usually very numerous, and ramify among the cells of the growth, being either in close contact with them or separated by a little fibrillated tissue. In the carcinomata, on the other hand, the vessels are supported by a more or less abundant stroma. Of all the varieties the round-celled sarcoma is the most malignant, and these growths are subject to secondary changes, and especially fatty degeneration. They also undergo softening, caseation, calcification, and even pigmentation.

The sarcomata have a great tendency to extend and infiltrate the surrounding structures. They are extremely apt to recur, though they rarely implicate the neighbouring lymphatic glands. Sarcomata are often found to occur after some previous local irritation. The skin, muscles, nerves, bones, periosteum, and glands are the chief seats of these growths, which vary very considerably as regards the tendency to recurrence. As a general rule the firmer its consistence the less likely is the tumour to recur; in soft, rapidly growing sarcomata the prognosis is unfavorable. The secondary growths occur in internal organs, especially the lungs and liver.

The sarcomata are tumours composed of embryonic tissue. Many tumours known as fungus hæmatodes are a variety of round-celled sarcoma. They consist of round cells, distinctly nucleated, and surrounded by a soft pulp. On *section* the surface is homogeneous, of a greyish hue, and slightly transparent. They are chiefly found in the breast, testicles, and bones. Another variety is the melanotic sarcoma. It consists mainly of spindle-shaped cells loaded with pigment. Sometimes the cells are round or oval. The tumour is sometimes pigmented throughout, sometimes only in places. Melanotic sarcomata are very prone to recur, the secondary growths making their appearance in many of the internal organs. They have been often regarded as cancers.

The *myxomata* are tumours consisting of mucous tissue. They are closely allied to the sarcomata with which they are sometimes classified. They consist of a homogeneous intercellular substance and cells of two kinds, one form being round and isolated, and the other angular and stellate with long and fine prolongations. These tumours originate from the connective tissues, and are found in adipose tissue, in the brain, spinal cord, and in the sheaths of nerves. Their growth is slow, but they may attain a large size.

The *fibromata* consist of well-developed connective tissue. They occur in two forms, soft and hard. The soft variety is generally found in the cutis, and consists of a very tough, rather œdematous, pale tissue. Their growth is very slow, and the tumours may attain an enormous size; they are often multiple, and frequently become pedunculated. In the course of time they occasionally give rise to general disturbance of nutrition. The hard fibromata consist of firm, closely woven fibrous tissue. They are always of firm consistence, and of a rounded knotted form, and in section either white or pale red. They usually contain but very few blood-vessels, but sometimes an extensive network of veins is formed in them. These tumours are found in the uterus (where, however, their structure more nearly resembles that of the myomata), in connection with periosteum, fasciæ, and the sheaths of nerves.

The *myomata* are tumours consisting of unstriped muscular tissue. A tumour consisting of striated muscle is of very rare occurrence, but fibres of this latter kind are sometimes found in sarcoma. The "fibroid" tumours of the uterus contain a large proportion of elongated spindle cells mixed with a varying amount of connective tissue. They are sometimes embedded in the uterine walls, and sometimes project into its cavity, or into the abdomen. Prostatic hypertrophy is to some extent due to myomatous growths.

Myomata also occur in the bladder, and in connection with the muscular coat of the stomach and œsophagus.

The *lipomata* consist of adipose tissue divided into lobules by strands of connective tissue. In proportion as the connective tissue is more or less developed the tumours are more or less firm. They are generally roundish and lobed, and are separated from the surrounding parts by a more or less dense sheath of connective tissue They grow slowly, and their development is unattended by pain; they often reach an enormous size. Their most common situation is the subcutaneous connective tissue of the trunk and especially of the back. They are occasionally found in the subsynovial and subserous tissues, and in the submucous tissue of the stomach and intestines. A disposition to the formation of fatty tumours most frequently exists at a time when there is a general tendency towards obesity, viz. during the fourth and fifth decades of life.

Chrondromata are tumours which consist of cartilage. The microscopic elements may assume different forms. The cells may be few or very numerous, and round, oval, spindle-shaped, or stellate. The intercellular substance may be clear or more or less fibrous. These tumours occur most frequently in early life; the bones are their ordinary seat, but they have been observed in the ovaries, testicles, parotid, and mammary glands, and in the lungs. The growth of such tumours is very slow. Partial ossification often takes place.

The *osteomata* are tumours consisting of bony tissue. They occur on the epiphyses of the long bones (spongy osteomata), and also on the bones of the face and skull, and on the pelvis and scapula (ivory osteomata). In a third form the bony deposit takes place in certain tendons, fasciæ, and muscles. These growths, however, are to be regarded as the result of a chronic inflammatory process. The growth of the osteomata is exceedingly slow.

The *papillomata* resemble in structure the papillæ of the skin and mucous membranes, and consist, therefore, of epithelium, connective tissue, and vessels. In the cutaneous growths the epithelial covering is generally abundant; in the mucous papillomata it is soft and thin. Warts and horny growths are examples of the former variety; villous growths and polypi, of the latter, which is met with in the larynx and nose, on the gastro-intestinal mucous membrane, and in the bladder. In the two last-named situations these growths often give rise to severe hæmorrhage. It must be remembered that malignant growths from mucous membranes often have their surfaces covered with shaggy projections. True papillomata, however, are non-malignant growths; they are confined to the mucous membrane, and their epithelial covering is much more scanty than that of malignant villous formations. A simple papilloma may, however, develop into an epithelioma.

The *angiomata* are vascular tumours composed either wholly or partly of blood-vessels held together by a small amount of connective tissue. They have also been called erectile tumours, because their size and consistence vary with the quantity of blood they contain. There are two different forms of vascular tumours—the plexiform and the cavernous angiomata. The former variety consists of growths which are entirely composed of dilated and much hypertrophied and tortuous capillaries and intermediate vessels. They occur almost exclusively in the skin. The cavernous angiomata include the venous vascular tumours, erectile tumours, and aneurism by anastomosis. In many cases the angiomata are congenital or become developed soon after birth. In some instances there would appear to be an hereditary predisposition to dilatation of vessels. Both the plexiform and the cavernous angiomata are most frequently met with on the face and scalp.

Neuromata proper are tumours consisting almost entirely of nerve-tissue, but the term is used to describe various growths connected with nerves. Neuromata occur on stumps left after amputation, in the form of round or elongated enlargements of the divided extremity of the nerve. Fibromata connected with nerve-trunks sometimes contain filaments which closely resemble non-medullated nerve fibres. Neuromata are most frequently found in connection with spinal nerves; they are usually accompanied by considerable pain.

The *adenomata* are new formations of glandular tissue. They occur in the breast, and also in the mucous membrane of the nose, the pharynx, the intestines, the vagina, and uterus. They always originate from pre-existing glandular tissue, and in the breast they are often combined with the sarcomatous and the fibromatous types of growth.

The *lymphomata* are new formations consisting of lymphatic tissue. They are due to some inflammatory and secondary swelling of the lymphatic glands or to an idiopathic hyperplasia. In the latter case no source of irritation is discoverable. The glands which are especially prone to this disease are the cervical, the submaxillary, the axillary, the inguinal, the bronchial, the mediastinal, and the abdominal glands. The glands of the neck are the most frequently affected. In some cases the glands on both sides are simultaneously enlarged so that the neck is thickened and the movements of the head are much interfered with. The disposition to these growths generally ceases after some years, the tumours cease to grow and remain stationary for the rest of life. On microscopical examination all the cellular elements of the gland are found to be increased and enlarged, the whole organ becomes a mass of lymphatic cells supported by a small quantity of stroma; the blood-vessels become thickened. The glands, which have become enlarged as the result of chronic inflammation, much more frequently contain abscesses and caseous contents than those which have enlarged from idiopathic causes. Besides entering into the composition of the glands, lymphatic tissue forms the Malpighian bodies of the spleen, Peyer's glands, and the solitary glands of the intestines, and the follicles of the pharynx and tonsils. It has also been found in many other parts, around minute blood-vessels, and among the connective tissue of the bronchial tubes. It is found beneath the pleural and peritoneal epithelium, and that of the mucous membrane of the alimentary canal, and likewise in the medulla of bone. Lymph-cells are inclosed within the meshes of its reticulum. These cells, as found in the lymphomata, are often much larger than those normally met with; they are called myeloid or giant cells.

The term *lymphadenoma* has been applied to enlargements of the lymphatic glands in various parts of the body together with the development of lymphatic growths in internal organs, especially in the spleen and liver. The condition differs from that of leukæmia in that the white blood-corpuscles are not found to be decidedly increased in number. The process usually commences in a single group of the lymphatic glands, and afterwards extends to others. Lymphatic tissue subsequently becomes increased or developed in various internal organs, and the new growths may appear either as separate nodules or in a more or less infiltrated form. When developed the condition is known as Hodgkin's disease.

In order to complete the above account of morbid growths it is necessary to add a few remarks with regard to *cysts*. A cyst is a tumour composed of a sac filled with fluid or pultaceous materials.

There are three modes in which cysts may be formed:—(1) A cyst may form independently as a new growth, having a distinct elementary groundwork derived from cells or the nuclei of cells, pursuing a morbid course of growth and reaching an enormous development. (2) Cysts may form in consequence of obstruction, dilatation, and growth of natural ducts or sacculi, and (3) in consequence of enlargement and fusion of the spaces in connective tissue and the accumulation of fluid within them. Cysts are also classified with reference to their contents. Thus, simple or barren cysts are those which contain fluid or unorganised matter. Compound or proliferous cysts contain variously organised bodies. In cysts due to retention the contents vary with the nature of the secretion. Thus these cysts contain sebaceous matter, mucus, milk, &c., more or less altered in character. The exudation cysts contain serum. The compound cysts are so named from the occurrence of secondary growths in the interior of the original cyst. Examples of these occur in ovarian tumours. Cysts are also often found in other new formations, especially in connection with sarcoma, chondroma, fibroma, &c.

TUBERCULOSIS.

Tubercle, properly so-called, is that which was formerly known as *grey* or *miliary tubercle.* So-called "yellow tubercle" has been proved to consist of a great variety of morbid deposits in various stages of metamorphosis. The grey tubercles and various inflammatory products, often become converted into these caseous masses which have been miscalled "yellow tubercle."

Tubercle presents itself in the form of very small grey nodules. Each nodule consists of a mass of moderate-sized, round lymphatic cells, which are contained in the meshes of a very delicate reticulum.

The cells are translucent and slightly granular, and a nucleus is generally visible. A few large cells, called giant-cells, are mingled with the smaller ones. The reticulum is composed of delicate fibres, or of a material which is almost homogeneous, and scarcely visible on account of the number of cells. Various opinions are held with regard to the origin of these cells. Some think that they are migratory cells, *i. e.* leucocytes; others believe that they are developed from the proliferation of epithelium, especially that of the blood-vessels and their sheaths, and of the lymphatic vessels and serous membranes. The muscular cells of the arteries have been regarded as another possible source. Tubercles are found in the lungs, testicle, liver, spleen, and brain. They also occur in the bones and in the lymphatic glands. The mucous membrane of the larynx and of the urinary passages and intestines is also a frequent seat of tubercular deposit.

Tubercular growths are but sparingly supplied with vessels, and they therefore exhibit a marked tendency towards rapid decay. This begins at the centre of the mass, and passes through various stages until that of caseous degeneration is reached. The presence of the tubercles very often sets up inflammation in their vicinity, and this may go on to suppuration and to the formation of chronic abscesses and ulcers.

Many different views have prevailed with regard to the etiology of tuberculosis. The miliary form is now considered to be the true type, and one view regards tuberculosis as generally associated with caseous deposits or suppuration. It is supposed that certain irritant substances are absorbed from these sources, and conveyed to various organs of the body. According to this theory caseous degeneration is looked upon as the almost constant antecedent of tuberculous deposit.

Experiments which have been carried on during the last few years have demonstrated that tuberculosis belongs to the group of infective diseases. The dominant view at present is that some form of micro-organism is the cause of all diseases of this class, and Dr. Koch has shown that tuberculosis is characterised by the presence of a bacillus of definite form and presenting special peculiarities. Dr. Koch's process for discovering the bacilli is based upon the fact that certain aniline dyes impart a peculiar colour to these organisms. He proceeds as follows: One cubic centimétre of a concentrated alcoholic solution of methylen blue is mixed with 200 cubic centimétres of distilled water; to this is added two cubic centimétres of a ten per-cent. solution of caustic potash, the fluid being well shaken. The material to be stained is kept in this solution for from twenty to twenty-four hours, or, if at the temperature of 40° Cent. (104° Fahr.), for a half to one hour. The cover-glasses on which broken down portions of tubercle have been dried, are then placed for two minutes in a filtered concentrated watery solution of vesuvin. As a result, the methylen blue is displaced by the vesuvin from everything but the tubercle-bacilli; so that, after washing in distilled water, the bacilli stand out as blue rods on a brown ground. Sections are treated similarly; after having lain for twenty-four hours in the methylen blue, they are transferred to the filtered concentrated watery solution of vesuvin for fifteen to twenty minutes, then they are placed in distilled water till no more of the stain comes out, and afterwards in alcohol, oil of cloves, and Canada balsam. Here, also, the nuclei are stained brown, while the tubercle bacilli appear as delicate blue rods. All the other forms of bacteria which Dr. Koch has as yet examined in this way are stained brown, with the exception of the bacilli found in leprosy, which also retain the methylen blue in preference to the vesuvin. These bacilli may also be stained by other aniline dyes if the solution be made alkaline by the addition of caustic potash or soda. The bacilli found in this way are delicate rods from a quarter to a half the diameter of a blood-corpuscle in length. They are present in large numbers in all places where the tubercles are of recent formation and spreading rapidly, more especially at the border of the cheesy masses. They possess a special relation to the giant-cells, being found in their interior sometimes to the number of twenty in each cell. In old tubercles there are fewer bacilli, though they are seldom altogether absent, unless where the tuberculous process has come entirely to a standstill.

Dr. Koch has set up tuberculosis in many animals by inoculating them with these bacilli, and his experiments seem to show that tubercle is an infective disease, due to a specific virus, a peculiar micro-organism, and propagated by the conveyance of that virus from one body to another.

DERANGEMENTS OF THE LYMPHATIC GLANDS.

SCROFULA.

Scrofula is a constitutional disease or condition characterised by a tendency, especially during childhood, to the deposition of tubercles in various organs, and also to chronic inflammatory swellings of the lymphatic glands, often followed by abscess and ulceration. Other characteristic signs of the scrofulous diathesis are catarrhal inflammations of the integument (especially of the face and head); of the mucous membrane (especially of the eye); chronic inflammations of the periosteum and of the synovial membrane of the joints. The most prominent or familiar features of scrofulous affections are their tedious course and their proneness to result in partial or diffuse caseous degeneration or in imperfect suppuration. Scrofulous persons present a general delicacy of the tissues, and exhibit a marked tendency to inflammatory diseases, and profuse cell-formation as a result of any irritation. When the constitutional tendency is unattended with local lesions it is known as the scrofulous diathesis. Scrofula may come out, so to speak, at almost any period of life. Scrofulous signs often appear in the child after the reduction of the constitution due to an acute disease, such as measles, scarlet fever, mumps, and diphtheria. Scrofula being latent in the constitution, may be brought to the surface by untoward circumstances without other assignable cause. Want of food, bad lodging, in those who have been before well fed and housed, may show that it exists where it was before unsuspected. Age, by lessening all the powers of the body, sometimes causes scrofula to appear, which the fortunate surroundings of affluence have prevented from appearing during youth and middle life.

Seat.—The cervical glands are the most frequent seat of scrofulous inflammation, but the bronchial and mesenteric glands are often affected. The swelling of the submaxillary and occipital glands often follows dentition, eruptions on the head, inflammation of the eyes, &c., and appears to be due to irritation, but it also takes place in the absence of any obvious exciting causes, and it remains long after such causes have ceased to operate.

Causes.—A scrofulous constitution is in the majority of cases hereditary, but it may be acquired after birth. Some families are all scrofulous. Tuberculous parents often beget scrofulous children. Old age in both parents, and particularly in the father, is an occasional cause. Cancer and syphilis in the mother may give rise to scrofula in the child. Children of parents who have intermarried with near blood relations often suffer from congenital scrofula. The morbid processes which are associated with it most often appear in childhood and youth. Some members of a scrofulous race may escape altogether. In some cases scrofula shows itself in persons who appear to be in the best of health. As to the cause of scrofula nothing minute has been determined, but it is proved beyond doubt that long-continued bad food, bad air, and bad lodging, will produce it. The continuous breathing of air vitiated by respiration is doubtless a prominent factor in the causation of scrofula. Thus it is very common in Europe among Jews, whom the intolerant regulations of the dark ages compelled to dwell crowded together in particular quarters of towns. In India the practice among the poorer Hindoos of living huddled together, very many sleeping in one room, leads to the same result. Many of the Highlanders of Scotland and of the Swiss, owing to the hardships of their life and an uncertain supply of coarse food, and narrow, ill-ventilated rooms, exhibit scrofula. That it may also be produced in the offspring by the wreck of the constitution caused by dissolute living is beyond dispute. The soldiers of the armies of the Commonwealth in Ireland, freed from the severe restraints which their creed and associates imposed upon them in England, and made rich by the grants of lands which they received instead of pay, in many cases led lives of unbridled dissipation. The scrofulous constitution of many of their descendants may be observed in that country. Close intermarriages, a practice still prevalent in India, by intensifying any scrofulous trace, undoubtedly tend to the development in children of a scrofulous constitution. The relation between syphilis and scrofula is undetermined, but there is no doubt that the venereal poison, reducing as it does the general healthiness of all the tissues, tends to promote the development of scrofula in descendants.

Pathology.—The disease of the lymphatic glands is sometimes secondary to an inflammatory or some peculiar condition of the mucous surface which is in direct relation with glands, but it more often happens that this connection cannot be traced. We are in ignorance as to the nature of the irritant to the action of which the continuous inflammation is due. There is not, of necessity, any deposition of tubercles in the glands, the morbid change consisting in hyperplasia of their cellular elements, with marked tendency to caseation.

Symptoms.—The enlargement begins in one gland only, gradually other glands in the neighbourhood become affected, and often after very long intervals. Resolution may take place, and the swellings may disappear, or chronic suppuration may set in which ultimately ends in the destruction of the affected glands. In the neck one side only may be implicated, the other may remain quite healthy. In long standing cases, these glands undergo caseous degeneration. The change commences in the centre, and gradually involves the whole mass, which consists of semipurulent detritus, or if dried up it becomes converted into an inert concretion. Unsightly, ragged, and irregular scars, often reddish in colour, on the sides of the neck in young persons are certain marks of scrofula. They are the remains of those long-lasting unhealthy suppurations of the lymphatic glands, which are due to no other cause. Similar scars on the face, scalp, and other parts of the body, that affection described as "blear-eyed," nails twisted, or any other signs of necroses not due to injury, some varieties of eczema, of pityriasis, of otorrhœa, are also symptoms of scrofula.

A famous portrait of Dr. Johnson, by Sir Joshua Reynolds, now in the National Gallery of London, is a perfect example of the scarred face produced by scrofula, and of the affection of sight which is sometimes associated with it. The enlarged glands in the neck, behind the ear, and under the lower jaw, are often found in clusters; they sometimes attain a huge size, and are like knotted cords, or appear as shapeless lumps. Each gland can at first be distinctly traced, and is smooth, rounded, and somewhat hard to the feel. The enlargement is found to be due to hyperplasia of cells. In scrofula the termination of these unsightly swellings is either in gradual diminution till ultimately the original normal size is regained, or else in fresh attacks of inflammation and suppuration. When inflammation sets in the cluster of glands form one whole mass, and the skin over the tumour becomes adherent. After a time the glands suppurate, the skin gives way, and a sinuous ulcer, with undermined edges, is left behind. Very often the abscess does not burst, but the inflammatory products undergo caseation. Sometimes the tumour becomes angular in shape, and presents several points of openings. The caseous degeneration is best seen in the cluster of glands in the neck, and in those of the intestines and bronchi. Considerable variety is to be found in the appearance presented by scrofulous persons, that is to say, by persons having the tendency, but not necessarily exhibiting any active morbid change. Two types exist, with every intermediate variety between themselves and between each and the perfectly healthy form it resembles.

The *types* are *light* and *dark*. The *dark* is characterised by a peculiar coarseness of black hair, a coarse texture of skin, with too great shedding of the epidermis, particularly of the head, and with defective shapes occurring irregularly, as large head, thick chin, swollen abdomen, flabby flesh, swelled cervical glands, ill shaped features or hands, or ill-proportioned arrangements of body and limbs. The other, or *fair* type, often exhibits what is called *beauty* —a fine white skin, which reddens easily, fine blue veins being visible through it, red lips, rosy cheeks, thin and soft muscles, soft hair, light blue eyes, delicately chiselled features—but here, again, the disproportion which has been alluded to may generally be found in some parts. Scrofulous persons are more liable to ill-health than others, though it does not appear that their lives are necessarily shortened; they last as long, but have a lower form of vitality throughout life. Thus a scrofulous person has perhaps inflammation of the antrum with every cold; and instead of getting rid of an aural catarrh with an attack of earache, has a thickening of the tympanum and impairment of hearing.

Other symptoms are manifested in disorders of the skin. The most common and the earliest symptom of scrofulous diathesis is eczema and impetigo. Later on lupus sometimes makes its appearance. The affections of the mucous membrane appear in the vicinity of the natural outlets, or where the skin joins the mucous membrane. In these parts catarrh is common, and is often associated with skin eruptions. Thus coryza, otorrhœa, are often accompanied by eczema of the lips and ears. Catarrh affecting the bronchi often extends to the air-cells of the lungs, and ends in caseous metamorphosis leading to consumption. In scrofulous children diarrhœa due to ulceration of the bowels is a frequent symptom.

Other signs of scrofula are certain affections of the structures of the joints and bones. These generally end in suppuration, and ultimately leave fistulæ. Where the bones are alone affected caries and necrosis are the result.

With reference to the disorders of the special senses we find that scrofulous children often suffer from inflammatory affections of the ear and obstinate inflammation of the eyes. Opacity of the cornea is a distinct indication of a scrofulous diathesis.

The phlegmonous inflammation of the glands in the neck is often attended with fever and local pain, and as a result the health becomes much deteriorated. After a time abscesses form, and either burst spontaneously or may require lancing. Fistulæ result, and discharge pus for a very long time. Such discharges often produce exhaustion, especially if the patient be a young child.

Terminations.—Patients seldom die from scrofula. In children the intercurrent croup or hydrocephalus and tedious suppurating discharge from bones and joints are extremely dangerous. The diathesis once established is often tedious and protracted. There are alternations of improvement with increased severity of the symptoms. Recovery is common in cases where the health is not much deteriorated. A few scars in the neck or an opacity upon the cornea are all the evidences that remain. Such cases escape caseous deposits and tuberculosis.

Treatment.—Scrofulous children should be very carefully brought up, so as to prevent, as much as possible, any of the morbid changes to which their constitution is liable. They should be warmly clad, carefully fed, and have frequent change of air. Sufficiency of fresh air and muscular exercise are prophylactic measures of vast importance. If symptoms of scrofula begin to show themselves in the child of a very scrofulous mother, the child should not be allowed to suck, but should be provided with a healthy wet nurse, or fed on cows' or asses' milk. This precautionary measure is one of the utmost importance, as upon the first year of infancy depends the constitution of the whole life. When the child is older a regulated diet, taken at regular intervals, proper exercise short of fatigue, cold baths, regular hours of sleep, should be definitely prescribed. Besides the local remedies, such as iodine, for enlarged glands when they occur, the chief treatment consists in the exhibition of cod-liver oil, phosphate of iron, and, above all, in placing the patient in fresh country air. Cod-liver oil is highly useful in scrofula. Under its use chronic discharges from the ears and nose, swellings of glands, and even abscesses subside, and health is improved. In persons of slender frame, with thin and attenuated skin and flabby muscles, and whose pulse is generally above 100 owing to an abnormal activity of the nervous system, fat in any form, and cod-liver oil particularly, is highly beneficial. Fat being a heat-giving, force-supplying, and plastic agent, contributes to the nutrition and growth of the body. Thus cod-liver oil or any other oil, as almond oil or cocoa-nut oil, is especially indicated. Cod-liver oil may be used both internally and also rubbed into the skin with a view to absorption. The dose should be small at first, and gradually increased.

Phosphate of lime is another important agent, necessary both for nutrition and cell growth. It is useful in those diseases in which it occurs in excess in the urine. It should be given in small doses (one or two grains) three times a day. It is highly recommended in cases of diarrhœa due to scrofulous ulceration of the bowels. It may be advantageously combined with the phosphate of iron.

Chloride of calcium.—This substance has been tried and with good results. It is given in fifteen-grain doses in milk after food, and continued for a long time. Its effects are to improve digestion, to remove the enlargement of the glands in the neck, and to cure or relieve intestinal catarrh.

Syrup of the iodide of iron.—This preparation is especially useful in anæmic cases; it may be combined with cod-liver oil.

Iodine.—This drug is used only locally, in the form of a tincture or ointment. It is applied to swollen glands to remove the diseased products; care must be taken not to use too strong preparations so as to increase the inflammation.

Mercury.—In the form of Donovan's solution this drug has been prescribed with good results for children suffering from scrofula. Its use should not be pushed too far, and it is contra-indicated in cases attended with wasting. It may be given with advantage to fat, phlegmatic children, the subjects of scrofulous enlargement of the lymphatic glands.

Sulphide of calcium.—The good effect of this drug in scrofulous sores is well known. It is given in doses of $\frac{1}{20}$th to $\frac{1}{10}$th of a grain three or four times a day, and gradually increased to a quarter or half a grain. It should be persevered with for a very long time. Under its use the suppurating glands improve, the pus becomes healthier, and abscesses rapidly heal. Besides its effects on indolent abscesses it also improves the child's health, which may have failed even under a long course of cod-liver oil and lime or iron.

Baths.—Cold bathing or sea-water bathing is highly beneficial. The child should be accustomed to the use of cold water. For weakly children, however, and in cold damp climates or seasons, cold baths are generally inadmissible. For these tepid baths should be prescribed, either of sea water or of water to which a few ounces of salt have been added.

DERANGEMENTS OF THE OSSEOUS SYSTEM.

Rickets—Rachitis.

Rickets is a constitutional disease characterised by general cachexia, a peculiar condition of the bones, and often by albuminoid degeneration of some portion of the glandular system. It occurs as a cachexia in infants who, upon learning to walk, show bending or softening of the bones, muscular debility, and failure of general nutrition. The word *rachitis* signifies inflammation of the spinal column, which part, however, is seldom severely affected in rickets. The essential peculiarity of the disease is that there is deficient deposition of the salts of lime in the growing bones, and that the cartilages of the epiphyses are extremely thick. Hence, there is curvature of the shafts of the long bones (especially seen in the lower limbs), and enlargement of their extremities. Rickets is essentially a disease of childhood. It is rarely congenital, and probably not hereditary. It most commonly shows itself between the ages of six months and six years. Bad hygienic conditions, want of fresh air and sunlight, scanty and improper food, appear to be the most important factors in its production. Improper food is probably the most frequent cause of the disease, but it sometimes happens that children apparently well-nourished show signs of rickets.

Rickets has sometimes been regarded as one of the manifestations of scrofula. In the former affection, however, there is no tendency to enlargement and suppuration of the cervical glands, and the process which takes place in the bones never leads to caries. The retarded ossification in rickets has been attributed to the presence of an undue amount of lactic acid in the blood. This acid dissolves the salts of lime taken in with the food, and thus their deposition in the bones is prevented. This theory is supported by the fact that the urine of rachitic children is often rich in lactic acid and contains phosphate of lime in abnormally large quantities. Another theory places the cause of the retarded ossification in the diminished supply of the salts of lime. A third hypothesis refers the cause of rickets to inflammation of the epiphyseal cartilages and periosteum, the local disturbances of the circulation hindering the deposition of calcareous salts. The changes in the bones consist of proliferation of the periosteum and epiphyseal cartilages. There is an increased preparation for ossification, but an incomplete performance of the process. The epiphyses are thickened and not elongated, owing to the compression of the soft proliferated cells by the weight of the parts above them. Muscular action also tends to cause lateral deflection. The distortions of the bones depend partly on curvatures and partly on angular deformity. The latter occurs chiefly at the diaphyses. The curvatures occur chiefly at the epiphyses. They are often noticed at the posterior ends of the ribs on one side of the chest, producing obliquity of the thorax. Another deformity of the chest found in rachitis is the bending inwards of the costal cartilages at the points where they join the anterior ends of the ribs, and their projection forwards at their sternal ends. The last deformity is due to the softness of the parts and their want of power to resist the atmospheric pressure during inspiration. Distortion of the spinal column is due to the curvature in the dorsal or lumbar region, or in both. Deformities of the pelvis are due to curvatures of the pelvic bones at their points of union; shortening of the antero-posterior diameter of the pelvis is the most frequent consequence. The sutures of the bones of the skull ossify very late, and the fontanelles remain open even at the age of two or three years. The occipital bone is often thin and depressed (craniotabes). In the absence of proper bone formation the pressure exercised by the growing brain causes absorption of the cranium, sometimes to such an extent that the dura mater and pericranium come almost into contact. The glandular changes in rickets are seen in the liver, the spleen, and the absorbent glands of the abdomen. The liver becomes dense, elastic, and pale; the spleen is often much enlarged, hard, and dark coloured, and the glands show hyperplasia of their cellular structures. These changes usually follow, in point of time, those that occur in the bones, but they may precede them, and may be extreme while the osseous changes are slight. Persons who are extensively rachitic are generally small in stature. The head is large in proportion to the body.

Symptoms.—Rachitic children who have acquired the disease during the first few months of life are generally very precocious and bright and attentive. Physically the child is very helpless, thus contrasting with the activity of the brain development. The precursory symptoms are the same as in any diathetic disease. The child may be peevish or fretful, may suffer from capricious appetite, disordered bowels, fulness of the abdomen, enlargement of the liver and spleen. Craniotabes when present is pathognomonic of rickets. On pressing over the occiput we find a sort of depression, due to the thinness of that bone. This is one of the earliest symptoms. Rickety children are sometimes fat and plump. The onset of the disease is gradual. It is generally preceded by a chronic disturbance of the alimentary canal. There is sickness and diarrhœa of green mucous or copious watery stools, or the child suffers from languor or drowsiness, or from an attack of bronchitis, or of laryngismus stridulus; or, if an infant, from convulsions. The child becomes dull, peevish, and irritable, and refuses to play or to be amused. The disease now begins to develop. The progress is slow but sure. There are four well-marked stages or symptoms. At the commencement the child complains of (1) general tenderness and of pain on touching the chest-walls. It is restless at night; throws off its bedclothes, even in cold weather, to get itself cool, and has an enlarged or tumid abdomen. (2) Profuse sweating about the head, neck, and chest occurs during sleep, the other parts of the body remaining at the same time hot and dry. (3) General tenderness or sensitiveness of the skin even to gentle pressure. (4) The child cries at every movement, and passes large quantities of urine, often with scalding, and containing lactic acid and phosphates in large quantities. During this stage the osseous deformities become well marked. The bones appear enlarged at their ends, and the "pigeon-breast" shows signs of development. The curvatures of the bones appear later on, being caused by the pressure of the weight above them when the child attempts to walk.

In well-established cases the child sits in a heap in its mother's arms, with its back bent outwards and shoulders drawn up; the head is large and ill-supported, the frontal eminences prominent, the fontanelles widely open; there is enlargement of the ends of the long bones; the teeth are late in appearing, and decay soon; the central lower incisors appear as late as the tenth or twelfth month. The bones are soft, and bend readily under pressure, often leading to green-stick fracture; sometimes the knees are bent inwards (knock-kneed); very often the tibia is bent outwards and forwards (bow-legged); the chest is pigeon-breasted, narrow from side to side, and sternum thrust forwards. The epiphyses of the extremities are enlarged. The ossification of the epiphyses of all the bones is delayed and imperfect, hence curvature and angular deformity. The ribs are beaded where they join the costal cartilages, and the vertebræ enlarged at their epiphyses. In some cases the muscles are weak and flabby, and children often suffer from laryngismus. There is also general tenderness.

Complications.—Children so affected are liable to dyspepsia, intestinal and pulmonary catarrh, eczema, broncho-pneumonia, to spasmodic affections, as convulsions, laryngismus stridulus, and croup, and to chronic hydrocephalus. Those cases which are complicated with convulsions are generally fatal.

Terminations.—The disease under proper treatment ends in recovery. The emaciation becomes less, the body improves, and the protuberant belly becomes smaller, the pain, tenderness, and sensitiveness subside, and some of the superfluous bone is absorbed.

When the disease occurs in older children the chief symptom is the pain in the limbs on the least exertion. The long bones, the ribs, and the vertebræ become distorted and curved. The child walks with a clumsy gait.

Diagnosis.—The rickety child is in pain when it puts its legs to the ground, and therefore refuses to walk; this symptom often leads to confusion with infantile spinal paralysis, with rheumatism, with chorea, and with hip-joint disease. The state of the muscles, and their action to electricity, exclude paralysis; the normal temperature, rheumatism; the non-affection of the hand, chorea; while the usual method of examination will satisfy the physician that hip-joint disease is not present.

Treatment.—Attend to the diet. The breast should be given at regular intervals, and only for a certain time. The child should be weaned at once if suckling has been too long continued. Feeding by the breast only should be enjoined for the first eight months of life, from the mother if she be healthy, or from a vigorous wet nurse. After the eighth month farinaceous food, good beef-tea, or gravy out of a joint of mutton may be given. A little salt should be added to the food. Some weeks later yolk of eggs, custard pudding, or underdone mutton may be tried. The child should be warmly clad with flannel next the skin. Fresh air and sea baths or brine baths are highly useful. It is a mistake to pause in the general treatment on account of complications. Cod-liver oil steadily given for a considerable period greatly aids in the cure of rickets.

Where the disease develops from chronic intestinal catarrh the child should have abdominal woollen bandages next the skin. The diarrhœa should be checked by attention to the diet. As it often depends upon undigested food means should be adopted for removing all sources of irritation from the bowels. Castor oil or rhubarb and soda are highly useful if there is pain and griping and the motions are offensive. Carbonate of lime or the phosphate of lime will check the catarrh and also supply chalky salts to the tissues.

The curvatures can be best prevented by causing the rickety child to sleep on a mattress and not allowing the head to be raised on a high pillow. The weight of the body and the action of muscles, two factors which assist curvature, should be counteracted by keeping the child in the recumbent position as much as possible. Where the curvature exists surgical aid is required. The chronic diarrhœa sometimes reduces a child a few months old almost to a skeleton. In such cases cod-liver oil, from twenty to thirty drops given every night, will check the diarrhœa and improve the general health, and promote nourishment and growth.

The practice of keeping children with curvature of the lower limbs standing immersed in sand on the sea-shore, for about an hour every day, is likely to be highly beneficial, if the child is not very weak.

Iron.—A course of dialysed iron, or maltine with iron, and phosphorus, is highly beneficial in promoting the powers of assimilation.

Phosphate of lime.—In rickets there is defective nutrition and want of healthy growth; both conditions can be improved by lime salts. They are best given after the active stage of pain and tenderness of bones has passed. The phosphate may be given in combination with carbonate of lime and lactate of iron. It is also useful in checking chronic diarrhœa in such children.

AFFECTIONS OF THE JOINTS AND MUSCLES.

Acute Articular Rheumatism.

Rheumatism is an idiopathic constitutional disease, the characteristic symptoms of which are febrile movements, inflammatory œdema and pain in the joints, or pain in the muscles and bones. The pain is due to the stretching of the elements of the affected tissue by the dilated blood-vessels. Rheumatism is not due to any injury, nor is it the result of any specific fever, as dengue, &c., but it often complicates other acute and chronic disorders. With the exception of those connected with the heart and pericardium, it is unassociated with any special anatomical lesions. As a rule, but few of those who have once suffered from it escape subsequent attacks. The disease has a tendency to leave one joint and attack another, very often it thus re-develops itself in parts of analogous structure and function.

Pathology.—Rheumatism is explained as due to the presence of excess of lactic acid in the blood. Lactic acid is a normal ingredient of the ordinary urinary excretion. In rheumatism, in consequence of some derangement of the emunctory organs, this acid is retained as a poison within the body, and circulates with the blood, which thus contains superabundance of this acid. Others explain the phenomena by suggesting that during health the starchy food is converted into lactic acid, that this combines with the oxygen and forms carbonic acid, and is thus excreted by the lungs. In rheumatism the lactic acid is produced in excess, owing to insufficient oxidation; it accumulates in the blood and excites inflammation in those tissues of the body for which it has a special affinity. This theory is at present superseded. It is now believed that rheumatism is a catarrhal neurosis, and supposed to be due to a form of malarial miasm. The poison has a predilection for the white fibrous tissue which forms aponeurotic sheaths or fasciæ, ligaments, tendons, and fibro-serous membranes. It also attacks the periosteum. Thus, the poison induces specific inflammatory affections of joints and of their capsule and synovial membrane. It also causes œdema of the connective tissue round the joints.

Varieties.—There are two forms of arthritic rheumatism, acute and subacute. The acute form resembles continued fever. It is a formidable disease owing to the suffering it causes and the damage it often inflicts upon the heart. In it two or more joints are affected simultaneously or successively. The rapid shifting of the acute pain from one joint to another within twenty-four hours is characteristic. There is a distinct blush of inflammatory redness in the skin over the affected joints. The fever is very intense, and there is profuse acid perspiration. It is a specific inflammation of fibrous tissues which seldom goes on to suppuration. It affects at times several of, if not all, the internal organs. The disease is not often directly fatal. In the subacute form of rheumatic fever all the symptoms are of a milder character. The inflammatory blush on the skin over the joints, and the tenderness on handling them are not so severe as in the acute variety. Often only one or two joints are involved in this form of the complaint.

Causes.—The predisposition varies in different cases. In some it may be hereditary. Persons of all ages are subject to the disease, it is rare in very young children. In children acute rheumatism is sharp and short, and often subsides even without treatment in from five to ten days, but in them the cardiac complication is extremely common. The affection of the joints may be so slight as to be overlooked. The fever is generally severe. In adults it is most common between sixteen and thirty years of age, and is rare after fifty. In them slight fever is associated with severe pain in many joints. The attack is generally mild, and often tends to become chronic. The disease of the heart, as a complication, is less dangerous as age advances. Catching cold and atmospheric influences induce the attacks which are most common during the winter months. Persons who work out of doors and live in damp or variable climates, and those who are hard-worked and badly fed are most liable to rheumatism. The strongest predisposing cause is a previous attack. The exciting causes are: A sudden chill produced by temporary exposure to cold and damp weather, suddenly wetting the body when heated, exposure to cold wind when the clothes are wet from perspiration. Rheumatism is apt to follow scarlet fever, measles, gonorrhœa, and the puerperal state. It is often associated with affections of the throat, and chiefly tonsillitis.

Morbid anatomy.—The lesions are chiefly found in the synovial capsule and in all the fibrous tissues of the joints. In the early stage there is hyperæmia of these parts, and effusion into the joint. The large joints are chiefly affected. The inflammation rarely ends in suppuration or in disorganisation. The blood always contains an excess of fibrine. There are often found fibrinous coagula in the heart and large vessels. When the heart or the pericardium is affected there will be the lesions of endo- or pericarditis.

Symptoms.—The acute attack may set in suddenly or gradually. In the latter class of cases it is preceded by catarrh of the pharynx or by tonsillitis in about 80 per cent. of cases. Very often there are premonitory aches or a sense of lassitude, depression of spirits, and bad sleepless nights. These are followed by local arthritic pains and stiffness. In other cases, the patient is quite healthy, and the arthritic symptoms come on suddenly. At the onset, shiverings occur, but there is not a distinct initial chill as we find in pneumonia, but only a slight rigor followed by high fever and restlessness. In the course of a few hours one or several joints become moderately painful; the pain rapidly increases to such an extent that movement is almost impossible, and the patient is completely helpless. In severe cases any attempt to move, or any pressure even of the bedclothes on the joints increases the pain. The main characteristics of rheumatic affection of joints are:—1. The large joints as the wrists, elbows, ankles, and knees are chiefly affected. 2. The affection may suddenly disappear from the affected joints and suddenly appear in others. 3. In many cases the same joint or joints are re-attacked more than once in the course of the disease. 4. The affected joint or joints are somewhat swollen. 5. Usually the affection of the joints is somewhat symmetrical or bilateral; it appears in corresponding joints at the same time or in quick succession. 6. Very often the inflammation extends to the muscles and fasciæ about the diseased joints. As a rule, there is no enlargement of the superficial veins over the joints, and neither pitting, nor desquamation of the skin such as is found in gout. 7. The pain is out of proportion to the swelling, being often very severe, while the affected part is but little increased in size.

The disease is of relatively short duration when only one joint is affected. Where several joints are affected the patient is quite helpless, he is unable to stir from any position in which he may be placed. Every effort at eating, drinking, urination, or defæcation is attended with pain and groans. Very often in the same patient the disease may be found only commencing in some joints which are painful only when freely moved, in the other joints the pain may be at its height and very excruciating, while in a few joints which have first suffered the disease may be in the stage of resolution, and only a slight or dull aching pain and stiffness remain. The swelling is most marked in those joints which are not deeply imbedded in muscles. The skin over the affected joints is often erythematous. The swelling is due to inflammatory infiltration or œdema of the skin and subcutaneous tissues round the joints, and to effusion into the interior of the latter structures. The swelling extends to the neighbouring parts, and hence the limb looks as if the ends of the bones were enlarged. The rheumatic affection sometimes attacks the fibrous tissue of the back or of the spinal column. In some cases the patients have long suffered from slight rheumatic pains in various parts of the body, as flying pains about the limbs, or pains along the course of certain nerves, and while they are still suffering in this way, an acute attack supervenes.

In acute articular rheumatism the pyrexia is considerable as in sthenic inflammatory fever. The fever sometimes lasts for about eight or ten days. It either accompanies or precedes the local inflammation, and is in proportion to the intensity of the local symptoms, and to the extent or the number of joints affected. Where the joints only are the seat of inflammation the temperature seldom rises above 102° or 104°. The pulse is soft, full, and quick. Where the case is complicated with pericarditis or with pneumonia, the temperature may rise to 107° or even higher, and the pulse is 130 or 140 per minute: such conditions indicate great danger. In uncomplicated cases the fever remits. The respiration is frequent, and the skin is covered with perspiration, copious and sour smelling, like fermenting bread. The sweating occurs at all stages of the disease, occasionally sudamina appear. With the sweating there is some mitigation of the local symptoms. Owing to great evaporation due to high temperature and profuse sweating, there is great thirst, and the urine is characteristically scanty, and of a high brick-red colour owing to the excessive quantity of the colouring matter, and is loaded with urates. The sediment is due to excessive waste of tissues. The chlorides are deficient. As in other febrile diseases, the digestion is deranged. The tongue is large, swollen, and is thickly covered with a dirty yellow or a yellowish-white fur, but is usually moist owing to the mouth being not habitually kept open.

Delirium and other evidences of nervous derangement are not usually observed unless there are cerebral complications. Unfavorable cases are of three kinds. Those in which the danger is due to the persistent high temperature. A second class in which the pericardium or heart becomes affected, and a third in which the danger is not of death, but of the disease passing into either the chronic form or into arthritis deformans. In subacute cases the swelling is slight, and the fever is less distinct. But it is most important to bear in mind that such cases, especially in children, are by no means exempt from the most formidable complications of the disease. The younger the patient the earlier the articular pain subsides. Where the large joints are affected the duration is shorter than where the small joints suffer.

Terminations.—The course of rheumatism is uncertain. Acute rheumatism does not run a cyclical course, nor end in crisis. The temperature does not generally rise very high, nor does it descend very rapidly. In mild cases the mode of defervescence is slow, the local symptoms gradually abate, leaving stiffness of the joints for a time, to be followed finally by free movements. With the diminution of the pain the temperature subsides. The fever remits in the morning and increases towards evening. In some cases the apparent favorable termination leads to the development of a tedious and obstinate form. Where defervescence is slow the relapses are less frequent, and ultimate recovery more sure or complete. The same holds good of cases where few joints are affected and fever slight, also where the intensity and extent of the inflammation and fever are in regular proportions. The relapses are frequent in cases which occur in winter, and in persons who are very anæmic. In many cases, after the fever, pain and swelling have disappeared, a few joints remain weak owing to the relaxation of the ligaments. The inflammatory infiltration sometimes leads to matting together of the soft tissues, and the joints consequently become permanently fixed. Chronic rheumatism is said to result. Death from acute rheumatism is rare. Fatal cases are due to severe cardiac complications or to blood-poisoning, causing sudden collapse, or the collapse may be preceded by low nervous symptoms as delirium or coma.

Complications.—These often come on insidiously, and must, therefore, be looked for in every case. The complications are:—1. Cardiac inflammation. Pericarditis, endocarditis, both of which are accompanied by some degree of myocarditis. Endocarditis is the more frequent, and occurs in about 20 per cent. of cases, and is far more dangerous to life. In persons under forty, and in those where a large number of joints are affected, these complications are very apt to occur. Endocarditis is more frequent in the asthenic form; pericarditis in the acute form. 2. Lung affections. Pleuritis, pneumonia, and bronchitis are rare. 3. Functional nervous disorders. Melancholia and stupor followed by chorea, are the most singular complications of all; half the number of cases of convulsive chorea have been preceded by rheumatism. 4. Tendency to metastasis, inflammation suddenly leaving the affected joints, and reappearing in others. 5. Two skin diseases are associated with rheumatism, that is to say, occur after attacks, or in persons liable to attacks, erythema nodosum, and herpes zoster. 6. Iritis appears in some cases, and if it has once occurred it is likely to complicate every succeeding attack.

Duration.—In mild cases, the disease lasts for ten days to a fortnight. In severe ones for many weeks.

Diagnosis.—Gout and rheumatism have many features in common, but differ in the points given in the table which follows.

If uncertain whether a swollen joint is due to rheumatism or gout, it is a good plan to put on a very small blister. The fluid from this is to be collected in a watch glass in which a thread is laid. If after evaporation crystals of uric acid are seen under the microscope adhering to the thread the swelling is a gouty one.

Prognosis in acute rheumatism, so far as immediate recovery is concerned, is good. Death occurs from the causes indicated above, but such cases are rare; and as a rule even the most severe complications do not prove fatal. No other disease, however, more frequently leaves results which are likely to shorten life. The vast majority of cases of valvular disease of the heart may be traced to an attack of acute rheumatism.

Relapses.—The frequency of relapses is well known. They can be avoided in many cases. They frequently occur in cases where the patients are allowed to use their joints very soon after the attack has subsided. Under such circumstances the fever and pains in the joints are very liable to recur.

Treatment.—The disease apparently yields to any treatment. If the joints are kept properly at rest, the acute pains usually subside within a period varying from two to seven days, without sedatives or drugs. The disease is thus said to have a self-limited duration. In acute cases the chief indications are:—1. To relieve the local and general symptoms, as pain, fever, perspiration, &c. 2. To prevent cardiac complication. To diminish the local manifestations of the disease salicine, salicylic acid, and salicylates are largely used. These drugs, however, are not successful in every case of rheumatic fever. Salicine, an active principle of different species of willow bark, should be given in fifteen or twenty grain doses, and repeated every two or three hours. Under its use the pain subsides and hyperpyrexia becomes less. It should be discontinued if deafness and severe headache, accompanied with a peculiar hurried breathing, follow its use. In persons of poor physical condition nervous symptoms, as headache, deafness, and even nausea and vomiting, occur. Salicylate of soda has been given in twenty-five or thirty grain doses, and repeated every one or two hours. Its good effects are manifested in two or three days by relieving pain and subduing fever. Salicine and salicylic acid are believed to lessen cardiac complication in acute rheumatism, their action being the same upon the pericardium as upon the structures of the joints. Moreover, the duration of the disease being shortened, the risk of complication is lessened.

The disease is often cut short in a few days, and to prevent relapse these drugs should be continued in small doses for about a week or a fortnight after the temperature becomes normal.

Another drug which has been largely given with good effect is the bicarbonate or the citrate of potash. The alkaline treatment, if persevered with, shortens the duration of the disease, and lessens the liability to cardiac complications. These salts should be given in pretty large doses until the urine is rendered alkaline. In order that the alkalies may be well tolerated by the stomach a few grains of citric or tartaric acid may be added to each dose of the bicarbonate.

It is supposed that rheumatism is produced by an excessive formation of lactic acid; that this acid has an affinity for certain tissues of the body and chiefly the joints. When alkaline salts are used this acid is neutralised, and thus the joints are protected from the ill effects of the acid. Alkalies should be used steadily. Under their use the fever becomes less severe and shorter; the urine, which is generally acid in rheumatic fever, becomes neutral or even alkaline.

For the relief of fever and also to subdue pain in the inflamed joints aconite may be given. It is often combined with diaphoretics. Where the patient is quite helpless from pain, and is complaining of profuse acid sweats, relief is obtained by a vapour bath. The natives of India apply heat in the following way:—The patient's clothes being removed, he is laid on a couch on a mattress perforated with holes. A pan of live charcoal is placed under the couch, and over the fire they strew *olibanum.* The whole body, except the face, is covered with a sheet, and the fumes thus obtained are kept up for about fifteen or twenty minutes, by which time the patient is bathed all over with perspiration. He is then removed to another bed, and his body dried with a towel. He thus experiences speedy relief, the pains subside, and he falls asleep. The cold douche has been substituted for the vapour bath with good results as regards the symptoms relating to the joints. In order to promote perspiration, cold water compresses to the joints, renewed every hour or two, or the cold wet sheet used in packing the whole body, or a tepid bath (and the temperature of the water gradually lowered to that of a cold bath while the patient is in the tub), or sponging the body with tepid or cold water several times a day have a far more beneficial effect than covering every joint or the whole body with warm clothing.

Quinia.—In acute rheumatism quinine in large doses of from eight to twenty grains, given every three or four hours, has been by some highly recommended. Those who advocate its use at the beginning of the attack think that quinine lowers the temperature by impeding oxidation or the carrying off of ozone from the lungs to the tissues by the red corpuscles. Other physicians recommend the use of quinine during the remission or at the termination of the acute symptoms.

Opium.—It is often of signal use, especially when used hypodermically. It relieves pain and procures sleep. For adults ten grains of Dover's powder with eight grains of nitre may be given every night as diaphoretics and to procure sleep. Nitre is supposed to have a further action in mitigating and shortening the attack of rheumatism. It is advised to be given in doses of thirty grains every three or four hours; under its use the quantity of urine increases, fever lessens, and pain is relieved.

Actea racemosa has been much used in acute rheumatism. It is said to subdue some forms of rheumatic pain more effectually than any other drug. It is more serviceable in chronic rheumatism and in rheumatoid arthritis than in acute inflammation of the joints.

Colchicum and iodide of potassium.—These are only useful in obstinate cases and where relapses occur.

Local treatment.—Rest to the inflamed and painful joints is absolutely necessary. A comfortable bed and flannel or cotton wool wrapped round the joints are essential for the patient's ease. Never allow the patient to lie naked. It is best to lay him in blankets, as his sweating makes him liable to take cold. Poultices are soothing to the inflamed joints, and they alleviate pain. They are most useful when the skin over the joints is hot, swollen, red, and painful. They should be changed every hour or as soon as they become cool. Any depleting or lowering treatment must be carefully avoided. Blisters to the inflamed joints reduce the strength of the patient, and by so doing tend to prolong the attack and retard convalescence, which in itself is very tedious in such cases. On the other hand, large flying blisters applied in the neighbourhood of inflamed joints often remove the pain and procure sleep. Various other popular remedies are in frequent use. As palliatives we may apply certain local remedies with the view of relieving pain and tenderness of the joints. Various anodyne lotions containing aconite or opium or the local application of alkalies sometimes give relief. Gentle friction with ether or elaylchlorure over the joints has been found beneficial. Wrapping the joints in cotton wool is essential as it protects them from friction of the bed clothes and from injury when moved from side to side. It has also the effect of giving constant warmth. The extension of the limbs by pulleys and weights has been tried, and gives ease by keeping the articular surfaces separate and at rest. The same object is gained by keeping a splint applied to the limbs. Wet compresses to the joints and even the application of ice had been marvellously effective in all the members of a family suffering from rheumatism where every other known local application has failed. During convalescence if the joints continue to be stiff apply iodine paint or use repeated blisters, or strapping with mercurial and ammoniacum plaster. The oleate of mercury with morphia is a good application.

If in spite of all these remedial agents sudden cardiac pain occurs, with frequent pulse and sense of oppression, cupping glasses, blisters, or poultices should be applied over the precordial region. Subjective symptoms, it must be noted, are often wanting, hence the necessity of frequent examination with the stethoscope.

If during the course of the disease constipation be present it may be relieved by podophyllin, given in one-third of a grain doses, combined with extract of henbane. Senna may be frequently administered, and purgatives, as a rule, may be continued as long as the stools are dark coloured.

Diet.—As the fever generally exhausts the patient, he should have light, nutritious diet. Hot drinks should be avoided as they increase the sweating. Lime juice as a cooling and refreshing drink is largely advocated. Solid meat ought not to be given. It may be resumed with very great care as convalescence advances.

CHRONIC ARTICULAR RHEUMATISM.

It is a chronic inflammation of one or more joints. It is a constitutional affection, and is not to be regarded as a purely local disease. It rarely passes from one joint to another, as is the case with the acute form. It occurs after exposure to wet and cold, and is chronic in its course and duration. As in the acute form the anatomical changes to be found in the joints are comparatively few. In chronic rheumatism the affected joints are not much altered in form. At different times different joints are affected, though, as a rule, the affection persists in the same joint. Once established the disease continues throughout life. It is for the most part unattended by febrile symptoms.

Causes.—Chronic rheumatism may result from an acute attack in which recovery has been incomplete. On the other hand, the attack may be mild and chronic from the first. Exposure to cold and damp appears to be the most common exciting cause. The patients are usually middle-aged or advanced in life.

Anatomical appearances.—These vary according to the duration and severity of the disease. We notice thickening and cloudiness of the synovial fluid. The capsule is thickened, the ligaments of the joint stiff, and somewhat hypertrophied. The fringe-like processes of the synovial membrane are also increased in size.

Symptoms.—The patient complains of pain in one or several joints. The pain is greatest at night, and occurs spontaneously; it is generally increased by pressure or movements. It is often worse after exposure to cold. On putting the hand over the joint, and moving it, we perceive a kind of crepitation. The joint appears swollen, the swelling is due to an increase of the synovial fluid, and to thickening of the ligaments and capsule. Owing to the joint being disused for a long time, its muscles become atrophied and it appears larger. In many cases the affected joint becomes stiff. Sometimes, but by no means always, there is a history of one or more attacks of acute rheumatism. Relapses or subacute attacks are common, and may occur at very short intervals. Any slight alterations of temperature lead to the attack. There is pain in the joint, which is also somewhat swollen. There is more or less fever, as shown by a rise of temperature, frequent pulse, great thirst and scanty urine. The sweating is almost constant. Such patients soon become weak, anæmic, and emaciated.

Complications.—Muscular or tendinous rheumatism (myalgia), various neuralgias and paralysis are common complications.

Treatment.—An immense number of remedies have been employed in this complaint, some directed towards the constitutional disorder, and others for the relief of the local manifestations. As constitutional remedies, guaiacum, sulphur, colchicum, mercury, are given as alteratives, while arsenic, iron, and cod-liver oil are often of service in asthenic cases. For the relief of pain opium, henbane, or aconite may be tried. Other drugs of equally good repute are:

Actæa Racemosa.—It is chiefly indicated if the joints are enlarged and stiff. It is said to relieve the pain suddenly. In rheumatic chorea its effects are greatly inferior to arsenic.

Hydrate of chloral.—The narcotic effects of chloral are well known. It often relieves the pain and affords relief. It may be given in ten grain doses three times a day.

Iodide of potassium.—The iodide is believed to quicken the absorption of inflammatory effusions. It is especially serviceable when the pain is worse at night, and when there is any history of syphilis.

Local treatment.—*Oleate of mercury and morphia.*—This preparation, formed by adding one grain of morphia to every drachm of oleate of mercury is highly useful in persistent inflammation of joints. Its soothing effects are due to its rapidly penetrating the skin, and coming into direct contact with the extremities of the nerves. About ʒss is used for one application. It should be used morning and evening for about four or five days or a week. It should be merely applied with a brush, care being taken that it is never rubbed like ordinary liniment.

Oil of mezereon.—This preparation, as well as the root, is used by the natives doctors in India in syphilitic rheumatism.

Baths are often very efficacious in chronic rheumatism. Warm sea-water baths, or hot baths with various preparations as of sulphur or alkalies, hot steam or vapour baths, all have proved beneficial in the treatment of chronic rheumatism. The temperature of each bath should not exceed 100°. It is very important to avoid catching cold after the bath. After the patient has taken several baths, their duration should be gradually extended until each bath occupies an hour or even more. In recent cases cold-water douche to the affected joint or joints is far more beneficial than warm and medicated baths.

Counter irritation.—The application of the cautery iron at a white heat to the affected joint, as practised in India, is often very serviceable in chronic rheumatism. The natives also cauterise the joint or joints with the juice of physic nut and with good results. Derivatives of various kinds, as rubbing the skin over the joints with stimulating liniments and anodynes, as opium and chloroform, or the liniment of aconite or arnica, spirit of mustard, or camphor liniment, afford relief. If, notwithstanding the derivative application, the pain, swelling, and stiffness persist, flying blisters or repeated application of iodine until the cuticle desquamates are useful. The natives use capsicum locally in these cases, and with success. In obstinate cases the surface over the joint should be made to suppurate for some time by the application of irritating liniments. Scott's ointment, which contains mercury, may be used locally. Shampooing and kneading the painful joints or muscles aided by strapping is very beneficial. The joints should be kept covered with flannel or cotton-wool. Flannel should be worn next the skin, and exposure to draughts and damp avoided. The constant current of electricity is said to afford relief to the pain. The health must be improved. The diet should be light, generous and nutritious. In young and recent cases, there should be regular exercise in the open air.

Muscular Rheumatism.

The disease is otherwise known as myalgia, a term implying an affection of a muscle or muscles, the symptoms of which are very violent pain which is increased on attempting to move the part.

Rheumatism also affects the fibrous aponeurotic sheaths of muscles, tendons, periosteum, and fasciæ. It is a common complaint among out-door labourers. It is usually acute and entirely disappears after a few days or weeks, occasionally it remains fixed in some muscles. No anatomical changes can generally be observed in these cases. Sometimes hyperæmia, serous exudation, and even inflammatory proliferation of the connective-tissue are present.

Causes.—The same as those of articular rheumatism. Exposure to cold, over-straining of muscles, &c.

Varieties.—These are named according to the location.

1. Myalgia Cephalica. In it the occipito-frontal and the temporal muscles, and the cranial aponeurosis are the seat of the pain.

2. Torticollis (Myalgia Cervicalis). It is otherwise known as stiff-neck. It affects one side of the neck, the head is turned towards the affected side. All movements are attended with much pain.

3. Pleurodynia (Myalgia Pectoralis or Myalgia Intercostalis). It affects the pectoralis major and the intercostal muscles. When the intercostals are affected, coughing, sneezing, and even the respiratory movements are attended with pain. In affection of the pectoralis major, the movement of the arm forward causes pain. The pain is often relieved by equable pressure.

4. Lumbago (Myalgia Lumbalis). It involves muscles of both sides of the lumbar region; the pain is severe and excruciating. The patient is unable to rise from his seat. The attack often comes on very suddenly and the pain rapidly increases, any attempt at movement causes intense agony.

The muscles of the abdomen, those of the back, shoulders, and even of the extremities are occasionally affected with myalgia.

Symptoms.—Myalgia may affect any of the muscles of the body. It often complicates acute rheumatism of the joints. It is not a local inflammatory affection. The only symptom is pain, which is described as tearing or stretching. There is no swelling, no redness of the skin over the affected part, and no constitutional disturbance. The pain is localised in a muscle or a group of muscles. It increases on movement. The whole muscle, or a part of it, is tender to the touch. Firm and steady pressure often gives relief.

Forms.—The affection may be acute, subacute, or chronic. In the acute form the pain comes on suddenly; it is worse at night, and generally remits towards morning. The pain is accompanied by inability to move the muscles. Application of heat lessens the pain. The pain may be fixed or wandering. In acute cases the disease ends within a few hours, or may last for some weeks, and then entirely disappear. Where the symptoms are mild, and the pain less intense, the affection is said to be subacute. The chronic cases last for weeks or even months.

Treatment.—The chief indication is to relieve the local pain. This is best effected by opiates, either given internally by the mouth or rectum, or hypodermically injected. Some acute cases get well under large doses of quinine. To the affected parts, sedative liniments of aconite, belladonna, or opium, or some stimulating embrocations, will suffice in mild cases. A large mustard plaster to the affected part, a hot bran poultice, or even an application of the juice of mudar is sometimes followed by a cure. Among the natives of India the general practice of applying a heated iron to the affected muscles is attended with considerable success. Some recommend acupuncture over the affected part. When the pain is fixed a continuous application to the painful part of a concentrated solution of hydrate of chloral and camphor, (equal parts dissolved in rectified spirit) is often attended with prompt relief Where the pain is wandering in the early stage, free purgatives and diaphoretics may be tried, and when the complaint becomes chronic, iodide of potassium, hydrochlorate of ammonia, guaiacum, arsenic, sulphur, and even colchicum may be given.

The application of the induced or the constant current is often efficacious. Rubbing and kneading the affected muscles sometimes gives relief. Vapour baths have been known to succeed where other remedies have failed.

Rheumatoid Arthritis (Arthritis Deformans)

Is a form of subacute or chronic inflammation of the joints. It is of greater severity than ordinary chronic rheumatism, and is connected with more serious changes in the structures of the joints. There are no signs of suppuration, but the cartilages are first roughened and then worn away by the friction of the articular extremities of the bones against each other. After the destruction of the cartilages, the bones gradually become worn away, but as the irritation gives rise to new bone-formation the surfaces of the bones remain firm and smooth. Outgrowths subsequently take place from the bone. The parts about the joint become involved in the disease, and are converted into cartilage and bone. The results are permanent deformity, more or less considerable impairment of motion, and shortening of muscles. The disease is more common in women than in men, and the patients are usually of middle age. Dissipation of various kinds is regarded as a cause, but the affection occurs also in persons of temperate habits.

Morbid anatomy.—The cartilages are primarily involved, and subsequently the synovial membrane, periosteum, and bone become affected. The cartilages become uneven and rough, and finally disappear, leaving the exposed bone smooth and polished. The synovial fluid is decreased, and the joint becomes dry. While the central portion of the bone is destroyed the peripheral structures form nodular outgrowths, which after a time become ossified. These bony outgrowths blend with the ends of the bones or break off and become loose. The ends of the bones may be completely displaced by these new formations, and assume a perfectly abnormal position. The joint is found to be almost or quite immovable, but, on the other hand, if there has been only a slight amount of new formation and much atrophy, the joint may be abnormally movable. The parts about the joints are thickened and ossified. The joints of the hands are especially liable to be affected.

Symptoms.—The patient is anæmic. The disease seldom results from acute rheumatism. It sets in gradually, or commences with languor, restlessness, and deranged secretions. It is always progressive, though a halt sometimes occurs. At first one or more joints of the fingers or of the toes are attacked with slight pain. The disease progresses slowly, the pain increases, and the patient is deprived of his rest at night. The disease then extends to the large joints, probably the knees and wrists, and sometimes to the spinal column. The joints now become stiff and painful on movement, are tender to the touch, and crepitate when the hand is laid on them. They are also thick and swollen. Such cases are common among the poor, and the patients generally become bedridden. The symmetrical appearance of this disease is characteristic; relapses are common. During relapse the same joint or joints become again affected, often with increased severity. Where only one joint has been at first attacked other joints are liable to become implicated when the relapse occurs. The attacks recur from time to time leaving the affected joints somewhat swollen, misshapen, and tender. Subluxation in the joints of the fingers and flexion of the phalanges on the metacarpal bones are characteristic. At last the joints become permanently altered and useless. Owing to the amount of distortion and nodulation of the joints and wasting of muscles the patient may become completely crippled. When the spine is affected curvature and rigidity are the ordinary results.

Diagnosis.—The disease begins with pain and stiffness of small joints, and after a time it leads to swelling and enlargement of the extremities of bones; there are no febrile symptoms. In rheumatism there is fever, the disease commences in large joints, but there is no characteristic deformity. From gout it is distinguished by the former beginning in the great toe and not in the fingers as in arthritis deformans. The characteristic uric-acid deposit is always to be found in gout, by no means universally in arthritis deformans. Gout usually attacks the rich and plethoric. The poor and debilitated are generally the victims of arthritis deformans.

Treatment.—The disease progresses slowly but steadily. It cannot be removed, but its course may be checked. For this purpose attempts should be made to improve the state of general health, and a long course of iodide of potassium with decoction of sarsaparilla may be advised. In the early stage bromide of potassium may be advantageously combined with the iodide, especially if the pain be very severe. Warm clothing, equable climate, and moderate exercise are valuable aids towards retarding the course of the disease. Tincture of iodine may be applied to the affected joints. Gentle friction, anodyne applications, hot fomentations, and strapping are sometimes beneficial. Galvanism may be employed for its catalytic action, and also to stimulate the affected muscles. The joints should not be allowed to remain completely at rest, for they are apt to become perfectly stiff in some unfavourable position. Moderate movement, passive as well as active, should be advised. Unfortunately the treatment of rheumatoid arthritis involves considerable expense, and is therefore out of reach of poor patients who are the chief sufferers.

Gout.

Gout, otherwise called podagra (foot-seizure), is a paroxysmal arthritic disorder, more or less persistent, and attended with deposition of urate of soda in the cartilage cells, fibrous tissues, and epithelial cells, producing diseases of joints. It also affects other textures, as manifested by the eruptions on the skin and the inflammation of the mucous membrane. It also shows itself by various modes of perverted nutrition. As a rule, the once affected texture never again resumes its former normal condition. The disease is a specific inflammation of a constitutional origin; it is often distinctly hereditary. In it there is non-suppurative inflammation, with considerable redness of the small joints, and chiefly of the great toe during the first attack. It is believed to be due to an excess of uric acid or of urate of soda in the blood. The tendency to relapse is very marked. The disease often becomes chronic, and is diagnosed with difficulty from chronic rheumatism. Both disorders are sometimes seen among the members of one family, the males suffering from gout and the females from some form of rheumatism.

Causes.—Hereditary predisposition can be traced in a majority of cases of gout. In these subjects any slight exciting cause leads to it, while any amount of exposure to injurious influences in persons not so predisposed seldom or never induces the disease.

Age.—It does not attack children. Generally it develops between twenty-five and thirty-five years of age, and even later.

Sex.—It is more common in males than in females. In the latter it is seldom noticed until after the change of life has occurred.

Habits of life.—The next most frequent cause to heredity is the plethoric condition. Persons who take more nourishment than is necessary or are addicted to high living, as publicans, butchers, and butlers, furnish the largest contingent of cases of gout. Free use of beer and wine, accompanied by sedentary habits and excessive mental exertion, predisposes to it. Depressing influences, by inducing malassimilation of food, lead to gout. Thus persons working in lead, those exposed to depressing influences of cold and wet and changeable climate more readily acquire the articular variety of it than others. All those circumstances which lower the nervous energy of a particular texture (as injury to a vein) in a person predisposed to gout tend to produce gouty inflammation; recurrence is also common on the least or most trifling provocation. In persons of sedentary habits and confined life oxidation is defective, the food is often not properly digested, and dyspepsia and liver derangement are the result. Such a condition predisposes to an attack of gout.

Pathology.—Those who contend against the view of gout being due to excess of uric-acid in the blood, emphasise the fact that some patients have only one or two attacks all their life This fact is supposed to be in favour of the neurotic origin of gout. On the other hand it is evident that, as urea is more highly oxidised than uric acid, any deficiency of oxygenation of blood will lead to an increased amount of uric acid. Excess of food, by supplying large quantities of nitrogenous materials, gives rise to an excess of uric acid, which ought to be expelled by the kidneys. The extra work thrown upon the kidneys may be satisfactorily performed for some time, but ultimately imperfect action of those organs results in the accumulation of uric acid in the blood. The uriniferous tubules become plugged and obstructed by the deposit of urates within them, the urates accumulate in the blood, and give rise to gouty kidney. It may be that the simple deposit irritates the tissues and sets up inflammation in a joint or joints, and thus leads to arthritic gout.

Morbid anatomy.—The lesions are chiefly found in the component structures of the joints, and in other similar textures of the body.

These are only the remains of more or less inflammation. They are always associated with incrustations of urates. In the early stage and in mild cases only a few of the joints are affected in this way. The superficial portion of their articular cartilages is covered over with opaque white patches. Sometimes only one joint, and chiefly the great toe, is thus damaged. In severe cases and later on, several joints are affected, the articular surfaces are covered with the specific deposits, the cartilages, periosteum, ligaments, and even the synovial membranes are more or less infiltrated, and covered with chalky-looking deposits. Sometimes the cartilages present a velvety appearance. In far advanced cases the synovial membrane is infiltrated, and appears covered with melon-seed-like bodies. The deposit does not take place in bones, but when in large amount it presses upon soft tissues surrounding the joints. The cancellous tissue of the contiguous bone becomes encrusted, the cartilage having been absorbed. In many cases the cartilages, owing to their infiltration and also to the deposit, lose their vitality and become brittle, and are gradually removed, leaving the denuded bone beneath. Sooner or later the bones also undergo destructive changes. These mortar-like deposits (tophi) gradually lead to a certain amount of erosion of the cartilage which covers the joints, so that the cartilage instead of presenting a smooth surface is rough, and appears thinner. Finally, an opening is made in the integument, by which the tophi escape externally. In such cases the joints are much deformed, and we see white chalky masses through bluish-red skin. In a majority of cases of true gout there are no other morbid changes beyond the deposit of urates in the articular cartilage. The deposit if analysed will be found to consist of clusters of needle-shaped, opaque crystals of urate of soda. These changes most frequently occur in the patella, and the first joint of the big toe. Enlargements of the ends of the bones occur in other joints, as the knee and knuckles. Gouty deposits are also found in the eyelids and cartilages of the ears. The small joints become distorted, and are sometimes dislocated. The distortions vary from a slight alteration to an ultimate anchylosis. Various other textures are also influenced by gout. Certain internal organs undergo degenerative changes ; thus degeneration of the arteries of the brain and heart, emphysema of the lungs, cirrhosis of the liver, and contracted granular kidneys are common.

Symptoms.—In cases of gout, deposit takes place in the cartilages of joints long before inflammation of the joints occurs. Acute gout is preceded by premonitory symptoms. The patient often suffers for a long time from indigestion. He is unable to digest certain articles of food, containing starch or sugar, which produce such symptoms as acid eructations, heartburn, and flatulence. Severe pain in the epigastrium with more or less vomiting and tendency to syncope have been noticed to precede a regular attack of gout. Derangement of the liver often exists. The patient may suffer from piles due to over-eating or constipation. Many patients show other results of high living, they usually become fat before gout appears; the nose is reddened from enlarged varicose veins, the urine becomes scanty and loaded with urates, the skin is dry and affected with urticaria. Very often there are dull pains or constriction in the left side of the chest, palpitation or irregular action of the heart, a sense of weariness, and profuse perspiration after any exertion. All these symptoms may be unheeded, and the attack of gout comes on quite unexpectedly. When the paroxysm occurs, the patient is roused from sleep generally between one and five in the morning by a severe *pain* in the metatarso-phalangeal articulation of the great toe, chiefly of the left foot, or of both feet at the same time, or (more rarely) the pain may commence in the thumb, or in the heel, or instep. The pain is so agonising that the patient sighs and moans and tosses about in bed, and trembles repeatedly. The pressure of the bedclothes increases the pain, which is described to be burning, tearing, boring, or piercing, as if a red-hot wedge were being driven into the joint. It is worse at night, remitting towards morning or during some part of the day. The onset of the pain is accompanied by a slight rigor, followed by fever, bounding pulse, great thirst, restlessness, and depressed spirits, or irritable temper. The tongue is thickly coated. The bowels are constipated, the urine is scanty, high coloured, rather acid, sometimes albuminous; the urates are deficient. Micturition is attended with scalding. The skin over the affected joint or joints looks swollen and red.

Towards the dawn the patient perspires and then falls asleep, partly from exhaustion, and partly from a slight remission of the pain. Thus the paroxysm ends, and on waking from rest, he finds the joint which ached in the night to be much inflamed, swollen, red, hot, and tender. The skin becomes of a dusky hue, and is tense and shining, or smooth and œdematous, pitting on pressure. The patient continues comparatively well till the next night, when the previous symptoms reappear, followed by remissions as before. The paroxysms thus continue for about eight or ten days, when the fever, pain, and acute suffering of the first attack pass away. The inflammation subsides, redness and swelling diminish, itching followed by subsequent desquamation of the skin over the affected part occurs, and scarcely any deformity remains. The urine lets fall an abundant sediment of urates and uric acid. The patient apparently regains his usual health.

During the interval these patients generally return to their usual habits of life, regardless of the injunctions of their physicians. Hence relapses are more common than they otherwise would be. At first the interval is a long one, but the attacks grow more and more frequent, the acute form changes and becomes irregular or chronic, the paroxysms longer, and the intervals between them shorter, till at last the patient is free from the attacks only for a few weeks in the summer. At the commencement only one joint suffers, gradually as relapses occur several joints in both feet and hands are affected. During the interval the patient often suffers from irregularly developed symptoms. In some cases the fever is very slight, and there is severe pain with little or no swelling of joints. The onset of the relapse may often be foretold in a gouty subject after an examination of the urine and of the blood. If the urine becomes deficient in lithic acid, and the blood contains it in excess, the approach of a fresh attack is to be apprehended. After numerous attacks or recurrences, deposits called tophi or chalk-stones are found around the joints.

Chronic gout.—The disease is chronic in its duration. The fever and pain are not so intense as in the acute form. There may be more or less dyspepsia all throughout. During the attack the skin over the joint is œdematous, but less red and swollen than in the acute form. During the interval the œdema of the skin remains, and there is no desquamation. The skin continues soft and doughy, and after several repeated attacks the swollen parts contain tophi. *Joints.*—In chronic gout, in addition to the toe, the small joints of the fingers, the heel, the instep, and even the large joints are affected. The disease extends gradually from one to several joints of one or both feet or hands. Sometimes several joints become affected simultaneously, or follow one another in quick succession. In some patients one single joint becomes disorganised in the course of several successive attacks. In a majority of cases tophaceous concretions are formed in the affected joints, and the material is also deposited in the cellular tissue outside the joints. Owing to the deposit within the joints and to the inflammatory changes in the capsule and ligaments, pain is felt during the intervals, and the joint becomes stiff, enlarged, and nodulated, often deformed and anchylosed. The skin over the joints sometimes becomes ulcerated, exposing to view chalky-looking masses of urate of soda, of phosphate and carbonate of lime (tophi) mixed with pus. The tophaceous deposit in the cartilages of the ear is a diagnostic sign of gout.

Other gross changes in the parts of the inflamed joints take place. Bony outgrowths are common. The smaller joints are most frequently affected, and suffer most severely; gradually, however, they become knotted and permanently altered in structure and form. These nodes are limited to the distal ends of the fingers. The joints look bulbous, and the little finger is curved in towards the ring finger. These nodes often become red, hot, and painful whenever a fresh attack supervenes. The least source of irritation, *e.g.* a slight injury in persons of gouty disposition, sets up arthritis.

If the disease has long continued, or occurs in persons with strong proclivity, other structures within and around the joints, such as ligaments, synovial membranes, tendinous sheaths, and aponeuroses of muscles, become thickened or deformed. In the case of bones anchylosis occurs. In such cases grave results are often produced by the occurrence of gouty deposits in the kidneys and the heart.

In well-established cases of chronic gout, after a few acute attacks, the patient continues to suffer more or less from signs of dyspepsia, such as acid eructations, heartburn, vomiting, &c. The liver is disordered, and the patient becomes emaciated. Owing to gouty dyscrasia or to the impoverished condition of blood, chronic bronchitis, leading to emphysema and asthmatic attacks, is a common respiratory trouble. These affections are supposed to be due to general vascular degeneration in the lung. Sometimes asthma alternates with fits of gout in a joint. Other changes are produced in the heart and the vascular system. These are functional derangements, and known as palpitation and irregular action, with throbbing in the large vessels. Various nervous disturbances, as irritability and uneasiness, are pretty constant symptoms.

Where renal degeneration takes place the heart subsequently becomes organically disordered, and we find fibroid changes in the valves and cavities, and as a result hypertrophy of the left ventricle, mitral regurgitation, atheroma, and dilatation of the aorta. There is sometimes atheroma of the coronary arteries, leading to angina pectoris. The changes in the circulatory system are marked. The veins are full and dilated. There is tendency to phlebitis and proneness to clot.

The effects of gout upon the kidneys are seen in degenerative changes, due to the deposit of urate of soda, or giving rise to interstitial nephritis ending in small, hard, red, and granular kidney. The urine is pale in colour, rather acid, more watery, deficient in uric acid, is often albuminous, and of low specific gravity. Persons of a gouty diathesis often suffer from lumbar pains, gravel, and renal calculi. Gouty subjects have thus specific troubles of the urinary system. In females severe uterine pain with leucorrhœa or menorrhagia is sometimes due to gouty taint.

Eczematous eruptions on the extremities are common in gouty patients. The complexion of gouty subjects is often florid, and the capillaries on the ears, cheeks, and nose somewhat dilated. There is also some amount of sallowness mixed with the florid hue. The hairs often become grey at an early age and fall out, especially about the vertex. The alveolar processes of the jaws undergo slow absorption, and the teeth are prone to become loose.

To ascertain if the case be one of true gout seek for history of hereditary predisposition, for the operation of causes, as high living, &c., have regard to the age and sex of the patient, and inquire into the history of the joint-affection. If the blood be examined the red globules are found to be diminished in chronic or debilitated cases. The fibrine is increased if the affection of the joints be severe. The serum contains urate of soda.

At the commencement of the disorder the uric acid is found only in the blood-serum, but in advanced cases it produces extensive changes in different textures of the body. Its presence may be detected in the fluid of blisters, in the dropsical accumulations, and even in serous effusions. A deposit of urate of soda is also generally detected in the affected joints. To detect uric acid in the serum place the latter in a broad and flat glass dish, about three inches in diameter and a third of an inch deep; add acetic acid in the proportion of six minims to each drachm of serum. Place in the mixture a few threads of unwashed linen, and allow them to remain for a day or two. The uric acid, if present, will crystallise on the threads and the crystals may be detected by the microscope.

Irregular gout.—It is met with chiefly in elderly people the subjects of the diathesis. It also shows itself in the course of diseases occurring in persons of a gouty habit. In them the true gout may have escaped exact recognition. The disease is recognised by functional disorders of the liver. It is one of the results of lithæmia, a condition common both to hepatic derangement and to gout. In some lithæmia leads to the former, in others to the latter complaint. Like acute gout this variety is also paroxysmal; predisposition to it is hereditary. Age, sex, and habits of life and history of joint-affection similar to that met with in the acute variety aid in the diagnosis of the true nature of the symptoms.

The most common manifestations of irregular gout are:—1. Dyspepsia. 2. Frequent deposit of lithates in the urine. 3. Eczema from time to time. 4. Sharp anomalous pains in various muscles, fibrous, synovial, and other articular structures. All these symptoms disappear for a while and are forgotten until they recur. There is sometimes a bulbous distortion in the fingers, supposed to be due to spasmodic retraction of the muscles, reflexly excited by painful arthritis. Itching on the instep is also a common symptom in irregular gout, but there is no redness nor swelling to be found.

Headache is one of the irregular manifestations of gout in women. It is paroxysmal, and increased on stooping. There is great tenderness of the scalp, chiefly over the vertex, where the slightest touch of the hand causes very severe pain.

Persons of a gouty diathesis also suffer from erysipelas, and are extremely sensitive to the topical influence of arnica. The aching pains in the muscles are best exemplified by cramps in the legs noticed in cachectic persons, and associated with granular kidney. Deep-seated pain in the heel, as if a foreign body has been struck, is an out-come of a gouty taint. Sometimes the pain is felt in the tendo Achillis.

Mind, disposition, and temper.—In gouty paroxysms there is often a feeling of malaise or an irritability of temper or the reverse, depression of spirits, languor, and listlessness. Insomnia generally occurs in gouty conditions in the early hours of the morning, and is associated with some horrid dreams or with nightmare. There are various nervous symptoms attributable to a gouty habit. These are headache, vertigo, and numbness in the limbs. Gout is often associated with temporary glycosuria in elderly persons, and in such patients sugar in the urine is found to alternate with uric acid.

Gouty patients often suffer from asthma and even angina pectoris, and laryngeal dyspnœa sometimes occurs. Lumbar pain on first awaking is an occasional symptom of irregular gout. All these symptoms occur in more or less close connection with joint-affections in young persons who live very freely. Other symptoms are often seen in the throat; the uvula and the posterior parts of the fauces are red and glazed. The uvula is also elongated and œdematous at the border or tip. The pharynx is red and studded with glairy prominences, and covered with greyish mucus. There is also occasional pain and enlargement of the tonsils, one tonsil being affected at a time. Gouty persons often snore loudly during sleep.

Metastatic, retrograde, or retrocedent gout.—In this form the symptoms are not found to occur in their accustomed seat. The deposit of urates, with hyperæmia and inflammation, takes place in some internal organ as the brain (cerebral meninges), heart, stomach, or kidneys. The intestines also are sometimes affected. Metastasis is likely to take place after a gouty joint has been exposed to cold. Such attacks are violent and threatening to life, but generally brief, and end favorably with a copious deposit of urates in the urine, or with gout in a joint. When the stomach is affected there is nausea, vomiting, heartburn, eructations, and spasm or cramp, which, if not relieved, are soon followed by prostration, and even hæmatemesis. When the heart is affected, palpitation, distressed breathing, pallor, faintness, and debility, are the symptoms. In case of the brain, headache, giddiness, and vomiting are present. Very often chalky deposit invades the kidneys, being deposited within the tubules, and subsequently in the inter-tubular substance and leading to the contracted, indurated, or gouty kidney. A similar chalky deposit is found in the walls of the arteries of the brain, and it gives rise to various evidences of perverted nutrition, such as mental depression, nervous weakness, frontal headache, pain in the occiput or the nape of the neck. There is often a hectic flush about the cheeks and redness of the nose. There is a desire to be left alone, and the patient becomes fickle-minded and irritable.

Diagnosis.—Rheumatism is the only disease with which gout is likely to be confounded, but it is only in chronic cases that there is any difficulty in determining the nature of the case. The distinguishing characteristics of both diseases will be found at the end of this chapter (p. 297).

Complications and sequelæ.—Chronic Bright's disease with granular kidney is a frequent complication, and perhaps a result of gout. Deformity of joints often remains. The disorders associated with chronic gout are dyspepsia, palpitation of the heart, paroxysms of mental depression and irritability, renal colic, &c.

Prognosis.—The course is tedious. Permanent cure is rare. In acute cases the danger increases with the metastasis or complications. Death is rare. In the young subject, and in those in whom it is hereditary, more than one joint becomes affected. In chronic cases the prognosis is very unfavorable, owing to the non-elimination of uric acid from the blood, and also to the presence of urates in the uriniferous tubules of the kidney. In a confirmed or established case of gout, if any acute disease supervenes, or if even any injury or wound takes place, the chances of recovery are much prejudiced.

Treatment.—Of the acute attack. The predisposition cannot be eradicated, we can only attempt to prevent the attacks. This can best be done by regulating the mode of life before the disease becomes firmly rooted. High living being a chief factor in the etiology of gout, we should diminish the supply and increase the metamorphosis. In acute cases the object of the physician is to relieve the pain and render it bearable, and shorten the duration of the attack. During the paroxysm: locally, to relieve the pain, we may paint the inflamed parts with collodion. The Chinese use crystals of peppermint oil as a rubefacient over the painful joints; the joint should be kept at perfect rest and in an elevated position. To keep it warm, wrap it up in cotton-wool, covered by oiled silk, or apply anodynes, as opium on a poultice. The application of leeches to the affected joint, or any antiphlogistic treatment, has been known to lead to great prolongation of the disease, or to chronic suffering or irregular attacks. As internal remedies to relieve pain, aconite may be administered in small doses. Colchicum is well known to relieve the pain, subdue inflammation, and lessen fever. It may be given in drachm doses of the wine. Its effects are only palliative; under its use recurrences are frequent. It has no action in promoting the elimination of uric acid from the tissues through the skin or kidneys.

During the interval mineral waters, such as those of Vichy, Carlsbad, Ems, and Homberg, and hot sulphur baths, as at Vajeerábai, near Callian, in the Bombay Presidency, have proved beneficial in many cases. They act by reducing the plethora and dissolving the uric acid. Various drugs, as quinine, sarsaparilla, cinchona, guaiacum, various alkalies and earthy salts, as lithia, have been tried with varying results. The alkalies are given with a view to neutralise or diminish the excessive acidity of the urine, and to remove the uric acid by the skin and kidneys. Lithia water or bicarbonate of potash is recommended to be given till the urine becomes alkaline. The diet should be nutritious, non-stimulating, and digestible; the nitrogenised and saccharine constituents of food, and highly seasoned dishes should be sparingly used; the hours of meals regulated, and malt liquors and strong wines avoided. If a stimulant is required, brandy largely diluted with water or light well-fermented claret may be given. Beer must be avoided, as it retards transformation of tissues, and leads to obesity. Tea and coffee should be carefully used, as they, like beer, also interfere with consumption and diminish the need of nourishment. The affections of the joints, if threatening to become permanent, may be treated by shampooing, alkaline lotions, friction, or strapping.

In some cases complete avoidance of wines and spirits and extreme limitation of the diet, if rigorously enforced, are means to be deprecated, as they only weaken the patient and lead to attacks of chronic or irregular gout. All excess should be checked. Pain may be relieved by administering opium hypodermically, or internally in the form of pills, combined with belladonna, and the free action of the skin may be promoted by Dover's powder. If the stomach be irritable give cooling mixtures. The bowels should be kept open by the use of mild laxatives, aloes and rhubarb, to which colchicum may be added. Calomel should not be given if there be albumen in the urine. Restlessness may be relieved by anodynes. During the interval immediately after the paroxysm, or just at the beginning of the remission or the intermission, colchicum may be given with the best chances of success. The tincture or the wine may be given in half-drachm doses every three or four hours till the diuretic or cathartic effect is produced. It may be combined with potash or carbonate of ammonia. To correct the lowering effect of colchicum and alkalies, vegetable bitters, as gentian or calumba, may be combined. Some recommend to use colchicum only during the attack. The patient's room should be properly ventilated, he should take plenty of exercise, short of fatigue, in the open air, have daily baths, and wear warm clothes; sedentary habits, indulgences, and excesses of any kind must be avoided, and also exposure to the sudden alterations of temperature, and to wet and cold.

In chronic gout, during the paroxysms, as the urine is scanty and deficient in urates, diuretics and bicarbonate of potash and lithia may be prescribed with a view to neutralise the uric acid in the blood and to eliminate it by the kidneys. In cases of gout with albuminuria unstimulating diet is indicated. The good effects of drinking large quantities of pure water in such cases is well known, and under it the quantity of urea excreted is increased. The perspiration should be promoted by tepid baths, sulphurous baths, or by hot-air baths. Above all things keep the patient warm and avoid a chill. Great benefit is often derived from a change of scene and climate. Recreation or moderate exercise and relaxation from hard mental work should be recommended; muscular exercise hastens transformation of tissue and promotes excretion. Locally, for the joints, application of a flying blister every night, or the embrocation of opium and stimulating liniments with gentle friction are of benefit. If abscesses form near the joints use poultices. Iodide of potassium, both internally and as a local application, has been recommended. The joints should be kept wrapt up in flannel. Strong solution of carbonate of lithia, gr. v to ℥j, is very useful when applied locally to gouty enlargements, the object being to convert the urates in the tissues into the soluble urates of lithia. The solution should be repeatedly applied over the swelling. It is most useful in cases of gouty enlargements and where the skin is broken. Citrate of potash might be used with the same object. Under their use for weeks the deposits over the joints are reduced owing to the soluble urates being carried off through the skin.

In irregular or misplaced gout we should try to bring the disease to the extremities by mustard foot-baths and sinapisms to the pit of the stomach or the præcordia. Bronchitis, asthma, or dyspepsia occurring in gouty persons require colchicum internally.

DIAGNOSIS BETWEEN RHEUMATISM AND GOUT.

Rheumatism —1. *Predisposition.*—Heredity, seldom or never. 2. *Onset.*—Not sudden. 3. *State of life.*—Disease of poor and hard working, whether or not ill-fed. 4. *Age.*—Children, or those between fifteen and thirty; children with rheumatism are prone to cardiac disease. 5. *Sex.*—Both sexes. 6. *Cause.*—Generally from exposure to cold. 7. *Site and number of joints.*—In acute rheumatism many joints, medium sized or large; in chronic form, one or several large joints. 8. *Local symptoms.*—Less severe, pain uniform, duller; only acute on pressure; metastasis common; no desquamation of the skin. 9. *No chalky deposit.* 10. *Fever.*—In acute cases high and continuous. 11. *Sweats.*—Profuse and acid. 12. *Duration and course of attack.*—Duration uncertain, much longer, relapses frequent but not periodic. 13. *Complications.*—Morbid condition of the fibrous and serous structures, pericarditis, endocarditis, pleurisy, or peritonitis, in 30 per cent. of cases. 14. *Condition of blood.*—Uric acid absent; tophi absent; lactic acid present. 15. *Urine.*—Scanty, urates in large quantity, albumen sometimes, no casts, no disease of the kidney. 16. *Other disorders.*—Secondary digestion affected. 17. *Rate of mortality.*—Is greatest in children under ten years.

Gout—1. *Predisposition.*—Influence of heredity as a rule; nervous aspects more marked. 2. *Onset.*—Arthritis sudden and explosive. 3. *State of life.*—Disease of well-to-do classes. 4. *Age.*—Between thirty and forty, never before puberty. 5. *Sex.*—Common in males owing to nervous wear and tear and habits of life. 6. *Cause.*—No obvious cause; preceded by deranged stomach and other signs of indigestion; attack sometimes traceable to excess. 7. *Site and number of joints.*—Small joints, chiefly the great toe. 8. *Local symptoms.*—Pain severe, paroxysmal, and peculiar; it is out of proportion to the degree of arthritis; the joint swollen, œdematous, and shining; superficial veins enlarged; desquamation after a time; common results permanent enlargement and distortion. 9. *Chalky deposits.*—Within and around the joints, but not in bones. 10. *Fever.*—Moderate constitutional disturbance and morning remissions. 11. *Sweats.*—Absent. 12. *Duration and course.*—Short, seven to ten days; relapses common, periodic in early attacks. 13. *Complications.*—Morbid condition of the synovial and mucous surfaces, exemplified by conjunctivitis, urethritis, tonsillitis, bronchitis, pneumonia; affections of the stomach, bowels, kidney, and the brain. 14. *Blood.*—Uric acid in the blood, old clots in the auricles of the heart. 15. *Urine.*—Urates less in urine passed before and during the fit, urates in excess in the interval; albumen, casts, and kidney disease. 16. *Other disorders.*—Primary digestion affected.

Native Drugs and Prescriptions for Rheumatism.

The natives of India place great reliance in the following drugs, which are used in various combinations and with good results:

Chobi Chini.—China root. (Smilax China) of the Natural Order Similaceæ. This is known among the Hindus as Choba Chini. It is used as an alterative along with Anañtamûla (Hemidesmus indicus). Both these drugs are efficient substitutes for sarsaparilla.

Rásná.—The root, known under the name of Aristolochia longa, belongs to the Natural Order Orchidaceæ. Its vernacular name is Gandhanákuli. It is used by native physicians in rheumatism. The following is a form in which it is prescribed by most hakeems.

Take of Rásná, 2; Gulaucha, 3½; Devadára, 2; ginger, 1; and the root of castor-oil plant, 2 parts; to be made into decoction (1 to 20 of water). Dose ℥j three times a day.

Surinjan.—Is the Persian word for the corm of Hermodactylus. It is of two kinds, sweet surinjan and bitter surinjan, and is used for rheumatic pains of the joints much in the same way as colchicum.

(1) Take of Surinjan, 3 parts; Bozidan, 2 parts; Anisûn (Pimpinella anisum) 1 part; water 20 parts. Prepare decoction. Dose, ℥j to ℥ij.

(2) Take of Surinjan, 3 parts; Hiradâ (Terminalia chebula), 5 parts; Bisfáyig (Polypodium), 5 parts; Karafs (Apium graveolens), 3 parts; Gulâb Kalî (Rosa centifolia), 3 parts; water 30 parts. Make decoction. Dose, ℥j to ℥ij.

(3) Take of Surinjan, 7 parts; Kiramâníovâ (Artemesia cabulica), 2 parts; Pudinâ (Mentha vulgaris), 2 parts; black pepper, 2 parts; sugar, 6 parts. Reduce to powder. Dose, ʒj.

(4) Take of Surinjan, 5 parts; Sâthrâ (Origanum vulgare), 2 parts; Senna leaves, 2 parts; Jaffran (Crocus sativus), ¼ part; sugar, 3 parts. Reduce to powder. Dose, ʒss.

(5) Take of Surinjan, 2 parts; Ustukhudus (Lavandula stæchas), 3 parts; Bisfayig (Polypodium), 5 parts; Gulé Bâbûnâ (Matricaria suaveolens), 3 parts; water, 30 parts. Prepare decoction. Dose, ℥j to ℥iss.

(1) Take of *Gugula* (Balsamodendron Mukal), 6 parts; Gulavela (Cocculus cordifolius), 2 parts; Beherdâ (Terminalia Bellerica), 1 part; Hiradâ (Terminalia chebula), 1 part; Amlâ (Phyllanthus emblica), 1 part; Pimpala (Ficus Religiosa), 1 part; honey, 12 parts. The powder made into a mass. Dose, ʒj.

(2) Take of Gugula, 3 parts; Bozidan, 2 parts; Anisûn, 3 parts;

Suravârì hiradâ (Terminalia Citrina), one fruit; honey, 20 parts. Make confection.

(3) Take of Gugula, 12 parts; Hîmaga hirada (Terminalia chebula), 5 parts; Indragarea (seeds of Holarrhona antidysenterica), 1 part; Zirah (Cuminum cyminum), 1 part; Pimpala, 1 part; Bharangamûla (Clerodendron serratum), 1 part. Reduce to powder and mix. Dose, ʒj.

(4) Take of Chobi Chini (Smilax china), 10 parts; Mustakì, 2 parts; Cardamoms, 2 parts; Cinnamon, 1 part; Sugar, 5 parts. Reduce to powder. Dose, ʒj.

(5) Take of *Mâlakânganítela* (the oil of Celestrus paniculata), ¼ part; Tegabala (bark and capsule of Xanthoxylon hastile), 2 parts; Pimpala (Ficus religiosa), 2 parts. Mix. Powder. Dose, ʒss three times a day.

In cases of acute rheumatism, the pain and restlessness may be mitigated by the following:

Bhánga (Cannabis indica), leaves and capsules without stalks, ʒj; Jâyaphala (the fruit of Myristica officinalis), ʒss; Cardamom seeds, ʒss; Cinnamon, ʒss; Mustaki (gum resin Pistacia lentiscus), gr. xv. Powder and mix. Dose, ʒss to ʒj three times a day.

Chitráka chál.—The bark of Plumbago rosea, Natural Order Plumbaginaceæ.

(1) Take of Chitráka chál, gr. x; Hiradá (Terminalia chebula), gr. xx; long pepper, gr. xxx. Mix and reduce to a fine powder. Dose, gr. x to gr. xx, three times a day.

(2) Take of Chitráka chál, gr. xij; Khorâsânî âgvân (Hyoscyamus niger), gr. viij; Hiradá, gr. xx; Pimpala (Ficus religiosa), gr. xxx. Mix. Dose, gr. xv to gr. xxv.

CONSTITUTIONAL DISEASES.

Syphilis.

It is a chronic contagious disease and may be included in the same class with glanders and hydrophobia. It affects all the tissues which contain vessels. Medically it may be considered under two aspects, as it affects adults and as it is found in children. In adults it occurs in two forms, one induces merely local disease; in it there is an ulcer at the point of inoculation, in some cases associated with inflammation, often followed by suppuration, of the lymphatic glands in its neighbourhood. The other kind affects the constitution and is associated with extensive derangements of nutrition. That which concerns the physician is constitutional syphilis. This is first manifested by syphilitic induration of a sore situated on some part of the body, or occurring as a nodule without ulceration. Constitutional syphilis is a blood-poison, and shows itself in a variety of ways. Unlike the contagion of specific eruptive fevers the poison is not volatile, it does not remain latent in the atmosphere about the patient, but spreads only by direct contact or implantation. The genital organs are the most frequent seat of the inoculation, but other parts are sometimes accidentally affected; thus, a surgeon or accoucheur may become inoculated on the fingers. The poison is of a fixed nature, and is found in the secretion of the sore, in the blood (in the secondary stages of the disease), and probably in other fluids of the body of the person affected, *e.g.* in the saliva and milk.

Impure sexual intercourse is the chief method of propagation. Abrasion of the skin is not absolutely necessary, often mere contact with the virus is enough to produce the disease. The poison cannot be detected either under the microscope or by chemical tests. It is transmitted to individuals irrespective of age, sex, or the constitution. It would appear that vaccine lymph taken from a syphilitic child does not produce syphilis unless there be an admixture of blood, which is the medium of conveying the poison. In the case of syphilitic nurses who have communicated the disease to children it is probable that the poison has been contained in the discharge from excoriated nipples. Liability to the disease is extremely general. It may be transmitted to the mother by the fœtus or *vice versâ.* Like small-pox, measles, and scarlet fever, the disease once established only in very rare instances recurs in the same patient, but the taint remains in the blood for an indefinite period, especially in neglected cases.

Symptoms.—The disease appears in a succession of stages. In about three weeks from the date of the reception and absorption of the poison, a series of phenomena present themselves and mark the general infection of the system. Induration takes place at the spot where the virus has become implanted; the neighbouring lymphatic glands soon become enlarged and indurated; the skin and mucous membrane of certain parts are the seat of eruptions of various kinds and forms. The outbreak of these symptoms is often accompanied by headache and pain in the limbs, and by a more or less decided febrile movement. The formation of gummy tumours and indurations in various organs, affections of the eyes, bones and cartilages, and the development of a more or less well-marked cachexia, are the succeeding phenomena.

The primary induration appears, under the microscope, to consist of profuse proliferation of cells and nuclei embedded within the normal elements, but it presents no characteristic peculiarity. The skin over the indurated nodule or infiltrated mass at first does not exhibit any change of structure, gradually the epithelial covering begins to fall off, the new coating is thinner and of a dirty red colour. The nodule is occasionally somewhat tender. It often breaks. The duration of the hardness of the syphilitic sore varies. It seldom disappears in less than three months and may continue for half a year or longer. When the induration subsides it often leaves behind a brown coppery spot, the epidermis covering it being thicker than the surrounding skin. In the course of time the colour disappears and the spot becomes whiter than the adjacent parts. There is, however, no depression unless ulceration and loss of tissue have taken place.

Disease of the lymphatics.—Owing to the infection of the system the glands become enlarged. There is hyperplasia of the cell-elements, but no suppuration of the glands. These vary in size from a pea to that of a bean. They are almost or quite painless. The swellings often last for years. Their existence indicates that the poison of syphilis still remains in the body.

Diseases of the skin.—Syphilitic exanthemata. These depend partly upon hyperæmia and exudation, and partly upon gummy deposit in the skin. The eruptions may be classified as roseola, simple papules, scales, vesicles, pustules, and tubercles. Peculiarities of these eruptions: 1. Colour; they are often of a peculiar coppery colour and soon developed from a mere redness; are best seen on palms of the hands, soles of the feet, and on the bends of the limbs. 2. The stains left by the eruptions generally remain in the skin for a long time. 3. The seat of syphilitic eruptions is characteristic, they are chiefly found in places most exposed to air and those which lie immediately above the periosteum. Thus, a non-syphilitic eruption, as psoriasis, usually appears on the knees and elbows; when it appears elsewhere it is generally syphilitic. 4. In syphilitic eruptions various efflorescences take the form of a circle or part of a circle. 5. The syphilitic eruptions seldom or never itch. 6. The scabs which form in syphilis are very thick owing to the circumstance that there is usually an ulcer beneath the contents of the syphilitic pustule. The eruptions vary in kind. The most common is *roseola.* It consists of small irregular round spots, often confluent. It is one of the earliest symptoms of secondary syphilis. When neglected it passes over into the papular, scaly, or pustulous form of eruption. The *scaly eruption* (psoriasis) often begins as lichen or roseola. It is found in discrete spots, darker in colour than the non-syphilitic kinds. The scales are very thin and generally crack. The *pustules* are known as ecthyma when large and flat, and impetigo when small and pointed; they are sometimes solitary and sometimes in groups. There is also an eruption called rupia; it consists of oyster-shell-like crusts, which, when detached, leave beneath them a foul ulcer. The affection is grave and appears at an advanced stage of the disease. All these skin-eruptions are the result of irritative or inflammatory processes. There is yet another kind, which depends upon the development and degeneration of a neoplasm peculiar to syphilis. This occurs in the form of nodules both on the skin and in various organs of the body. These tubercles or nodules are known as gummata. They are hard to the touch. They are also known as granulation growths. These are formed of elements of a transitory character, they contain no mature connective tissue, and they are subject to rapid degeneration and death. Besides eruptions there are growths (warty) about the genitals, and even ulcers in the throat and over the tonsils. These ulcers are generally abruptly cut, not painful, but sometimes spreading. There is also a slight abrasion or peeling off of the mucous membrane of the mouth, palate, pharynx, and larynx. Loss of hair (alopecia) is common, so are also mucous tubercles or condylomata, where the skin joins the mucous membrane. These growths either become completely absorbed or shrink and remain, leaving a deep cicatrix, or undergo suppuration or ulceration and are thus removed. The nails also undergo permanent changes. The matrix becomes infiltrated and the nails are ill-shapen, fissured, and horny.

Affections of the mucous membranes, eyes, and bones.—The disease mostly affects the mucous membrane of the mouth, fauces, nose, larynx, and rectum; these parts are the seats of catarrh, mucous papules, ulcers, and gummata. In syphilis the tongue is sometimes characteristic. It is usually enlarged, and there are teethmarks at the side. The surface looks white and shiny, the epithelium is thick and patchy, lines of cicatricial tissue are visible on the surface, and on the dorsum there are visible fissures and cracks. These appearances with superficial ulceration on the sides are characteristic of secondary syphilis. In the early stage the mucous tubercles, raised patches of mucous membrane surrounded by a congested ring, are common on the dorsum and edges of the tonguo. In the tertiary form gummata or infiltrations are common. The gummata are felt as dense masses in the substance of the tongue. In infiltration the tongue is very large and hard to the touch.

Syphilis also attacks the iris and the choroid coat of the eye. Various affections of the periosteum and bones are common complications. In severe cases swellings appear upon the bones, accompanied by severe nocturnal pains. These swellings are known as nodes when hard, and when soft and boggy they are called gummata. These appear most frequently upon the bones lying close beneath the skin. The periosteum is often subject to inflammation and suppuration, and in consequence of the nutrient supply being cut off, caries or necrosis of a portion of bone is a frequent result.

Inflammation of the testicle.—This is an occasional symptom of constitutional syphilis, and is very tedious in its course. The disease commences in the tunica albuginea, there is proliferation of young cells and connective tissue upon the interior of the tunic and between the seminal tubes. The testicle contracts and indurates, and the proper substance of the gland disappears. In a few cases gummata or gummy infiltrations appear within the gland. In both cases the symptoms consist of a progressive enlargement of one or both glands, which become very hard and lose their natural shape. There is little or no pain. The enlargement is sometimes associated with hydrocele.

Among the diseases affecting the internal organs hepatitis is a common affection. Syphilitic nodules are also met with in the heart, spleen, kidneys, and even in the pancreas. Some pathologists have noticed similar growths with the lungs. Syphilis also affects the brain. Chronic inflammation of the meninges, and even syphilitic deposit within the cranium, have been demonstrated to occur.

The presence of a syphilitic taint is evidenced by palpable symptoms in a majority of cases. In a few there may be no signs of the persistence of the infection. In a generality of cases there is the history of a sore or primary ulcer, and indurated glands, followed after a period of several weeks by some skin eruption of a coppery colour or by condylomata. These are known as secondary symptoms. Then a period ensues during which one or other symptoms occur. There may be persistent small ulcers within the nose, or catarrh or ulceration of the mouth. The general health of the patient usually suffers. The period of latency varies in different persons. It is longest in persons enjoying good and vigorous health. It seems, however, that in exceptional cases the secondary symptoms set in sooner in persons of sound health than in those who are weak and debilitated. The latency observed in some rare cases for a very long period (fifteen or twenty years) is supposed to be due to the early use of mercury in the treatment of such cases.

Syphilis always follows a certain regular course, as is manifested by a certain range of symptoms. Thus within four to six weeks the primary sore will probably be followed by condylomata or skin eruptions, or iritis, or by an angina. At this period the patient is quite secure from disease of the bones, as caries or necrosis, or from destructive disease of the skin, as rupia, or from any other tertiary symptoms.

Syphilitic patients are more or less cachectic. The cachexia is due partly to the effects of the infection upon the system, partly to the nutritive disturbance to which syphilis leads, and partly to the constant recurrence of the attacks leading to diminution of the strength. When the patient is suffering from the effects of malaria, or is scrofulous or rickety, amyloid degeneration of the liver, spleen, and kindeys is very apt to accompany the syphilitic cachexia.

Treatment.—Mercury and iodide of potassium are the remedies mainly to be relied on in the treatment of syphilis. The infected excoriation should be destroyed by applying Ricord's paste (charcoal saturated with sulphuric acid), or by fuming nitric acid, or potassa fusa. This latter should be dissolved in an equal part of water and applied by means of a brush. Black or yellow wash may then be applied. The utmost cleanliness should be enjoined, and the patient should be kept at rest until the sore has healed. It is well to commence a course of mercury at once without waiting for the development of secondary symptoms. The induration may be that peculiar action through which contamination takes place, or an indication that the system is already contaminated; in either case it is best to attack it at once. Mercury may be administered in four ways—by the mouth, by inunction, by fumigation, or by subcutaneous injection.

Mercury is usually given by the mouth, and various preparations are employed. These are the blue pill, calomel, mercury with chalk, and the perchloride. Calomel is apt to purge, but this effect can be prevented by adding a small quantity of opium to each dose. A pill composed of calomel gr. j, Opii gr. $\frac{1}{6}$—$\frac{1}{4}$, forms a suitable combination, and may be given three times a day. The blue pill or the grey powder may be given in doses of gr. iij with Opii gr. $\frac{1}{6}$ night and morning. A fortnight is usually sufficient for the production of tenderness of the gums. The dose should then be lessened, but the remedy should be persevered with for several months, the utmost care being taken to avoid salivation.

Proto-iodide of mercury.—This form of the drug is often administered in combination with opium, on account of the severe pain in the bowels occasioned by its exhibition. It has no advantage over the preparations recommended above.

Corrosive sublimate.—It is administered in small doses. It is slow in producing salivation, and its use can be easily suspended at precisely the right moment. It cannot, however, be denied that calomel is at all inferior. The latter can just as well be stopped or discontinued when salivation commences. Corrosive sublimate should not be given on an empty stomach. Its dose is gr. $\frac{1}{16}$—$\frac{1}{8}$

to be given morning and evening. Tonics and cod-liver oil may be added in advanced cases.

Mercury is also administered with advantage in the form of inunction. Half a drachm of mercurial ointment may be rubbed in night and morning. This method of treatment is more satisfactory than any other, but under its use salivation sometimes occurs suddenly and severely. Slight salivation is the criterion that sufficient mercury has been absorbed to effect a cure or to produce a decided impression upon the system. In every case salivation should not be allowed to progress. It must be clearly understood that its continuance has no curative effect.

The drawback to the use of hypodermic injection of corrosive sublimate is the pain and inflammation of the skin, with partial ulceration, which it sometimes causes. The absorption of mercury by this method is, however, so quick that the slight pain or inflammation of the skin (which is all that generally occurs) can well be overlooked, besides, if the solution used for injection be a diluted one these drawbacks are experienced only to a slight extent.

The disease very often becomes latent, but does not altogether disappear. In such cases extremely small doses of calomel, as $\frac{1}{4}$ grain combined with opium $\frac{1}{12}$ grain, may be taken once or twice every day. The patient should be kept on a restricted diet and preserved from all noxious influences.

In every case where the health of the patient is much deteriorated, and where the employment of mercurials is contraindicated, the exhibition of iodine is attended with the utmost benefit. The iodide of potassium is the best form, and should be given in large doses, even thirty grains may be given every day. A few grains of carbonate of ammonia should be added to each dose. The syrup of the iodide of iron is of advantage where there is marked anæmia. Just as mercury causes salivation, so iodine produces catarrh, and even certain peculiar eruptions. If iodism be set up, its further use should be suspended. Besides iodine, quinine, iron, and even cod-liver oil, are often of service in the later stages. The natives give (1) lala chitraka (plumbago rosea), grain x; pimpala (ficus religiosa), grain xxx; mix and powder. Dose, grain x three times a day. Or, (2) anantamula (hemidesmus indicus), ʒiv, jeshti madha (glycyrrhiza glabra), ʒiv; màzêriûn (daphne mezereum), grain xv; boiling water, Oj; mix. Dose, ℥j.

Cod-liver oil three times a day is often very serviceable in obstinate cases of skin eruptions or of secondary syphilis.

Baths or fumigations.—Mercurial fumigations are strongly recommended in obstinate rashes. Calomel is preferred to any other mercurial, as it is not destroyed by heat or moisture, and its effects are certain and constant. Fumigation has this advantage, that under it the health is not much deteriorated, nor does the stomach suffer. The mucous membrane of the intestines also escapes irritation. About twenty to thirty grains of the drug are sufficient for one fumigation. The only drawback lies in the fact that the fumigation sometimes causes great weakness and general prostration.

Mercury is regarded as the most important medicine in the Hindu pharmacopœia. The word (párada) literally means that which screens or protects. It is supposed to protect mankind from many diseases. The natives purify it before using it in medicine. The best mode of purifying it is by rubbing crude mercury with brick-dust and garlic; it is then tied in a cloth and boiled in water over a gentle fire for three or four hours. When cool it is washed in cold water and dried. Thus prepared it is used for the preparation of mercurial compounds. Those most in use in medicine are rasa karpura, or the perchloride of mercury. It is a white preparation, a camphor-like powder. This is prepared by subliming block sulphide of mercury with common or rock salt. The red preparation, or rasa sindura, is largely used. It consists of dark red, shining scales. Another preparation, called kajjali (black sulphide), is also used by the Hakeems. The red sulphide or cinnabar is called hingula, and is used in Hindu medicine. It is used as an alterative tonic.

(1) Take of mercury, catechu, āā ʒss, pellitory root (akkal karâ) ʒj, honey ʒiss Rub together till the globules of mercury disappear. Dose, gr. v every morning and evening internally.

(2) For external application. For fumigation take of cinnabar (hingula) ʒj, realgar (manacila), or bisulphuret of arsenic ʒss. Powder and mix; about 15 grains to be used at a time. Very serviceable in obstinate skin diseases.

Congenital Syphilis.

Congenital syphilis is a disease occasionally manifested at birth, more commonly at from one week to six weeks after birth, rarely as late as six months; but, in exceptional cases, symptoms directly ascribable to hereditary syphilis have been known to appear so late as twelve or fourteen years, and at every intermediate period. Of 249 recorded cases, 217 showed symptoms before the third month. If a woman, the subject of primary or secondary syphilis becomes pregnant, the resulting fœtus often dies prematurely and is expelled by miscarriage. The child so delivered is often found putrefied. Where a woman contracts syphilis after conception, she seldom gives birth to a healthy or full-grown fœtus. The child if born alive bears marks of syphilis upon its body. In rare cases, the child thus begotten of a syphilitic parent lives for a long period. In still rarer cases, a syphilitic mother gives birth to a child, which never shows any signs of disease. In a majority of cases of children born with syphilis the disease is transmitted to them from their father, the mother being infected by the fœtus *in utero.*

Symptoms.—These are more marked on the skin and mucous membrane. The disease is more severe in children born with evidence of disease upon them than when it remains latent for some weeks after birth. In the former case syphilis manifests itself by the existence of blebs or pustules over the body. In the latter a tawny-coloured appearance of the skin over one eye is frequently the first manifestation of disease ; there is anæmia, pallor of the skin, retarded growth ; the muscles are flabby, the skin dry, rough, and hanging loosely, the cuticle generally desquamates. The face appears muddy looking, decrepit, and shrivelled, as if careworn and aged ; the nasal mucous membrane is swollen and pours forth a thin secretion ; eruptions of a moist kind break out on the palms of the hands and soles of the feet, or around the bends of the arms or thighs, or over the genitals. Sometimes these appear as yellowish, hard, scale-like patches, which on separating leave ulcers. The mucous membrane at the angles of mouth also becomes inflamed and ulcerated.

Ulcers, fissures, and condylomata are common about the anus, and spread to the genitals, thighs, and loins ; also white patches on the roof of the mouth and hard palate. The voice or cry of the child is peculiarly hoarse and snuffling ; there are also nasal discharges, which often clog the nostril and interfere with breathing. The child soon begins to waste. The fontanelle is usually open and ossifies late. The teeth are said to present certain peculiarities. The temporary incisors are cut early, but speedily crumble away. The permanent ones are peculiar. The two central ones are short, peggy, deformed, and rounded at the angles, separated by a gap or turned towards each other ; with edges jagged and having a vertical notch, with a shallow groove running up to the gum in front and behind. The child has commonly a discharge from the ear.

Termination.—In unfavorable cases the dirty red-coloured cuticular patches become changed into blebs with turbid contents. Such blebs are common upon the toes and fingers, and generally appear in crops. Often the nails fall off. Such cases end fatally in a fortnight or may live for a few weeks.

Diagnosis. From rachitis.—In rachitis the characteristic eruptions on the skin and on the face are absent, as are mucous tubercles about the anus and angles of the mouth. Syphilis generally develops in first six weeks after birth, while rachitis is not observed until towards the end of the first year. Tawny-coloured patches and psoriasis are only found in syphilis. The enlargement of the spleen is a sign of syphilitic cachexia.

Treatment.—In severe cases where the disease appears to manifest itself from birth, no remedial agents are of much service. In the second form much good can be obtained by appropriate treatment. Very small doses of mercury, in the form of Donovan's solution, or of calomel from $\frac{1}{12}$ to $\frac{1}{6}$ grain morning and evening, are generally curative in these cases. Inunction may be prescribed with good results. The treatment by mercury should be pushed till decided improvement results.

The child should be well fed. The wet-nurse should be changed if the disease has been communicated to the child through the milk. If the child has contracted the disease from the mother the suckling should not be discontinued, as the mother is already syphilitic and is proof against further contagion. In grown-up children, to improve the state of general health, various alteratives and tonics may be given.

HYDROPHOBIA. RABIES.

This disease is due to a poison received from dogs, wolves, foxes, &c. The word signifies water-dread. The poison is communicated through the saliva of rabid animals by inoculation only to other animals and to human beings: it is highly contagious. It produces at first some peculiar alterations in the blood, subsequently it affects the nervous system. The poison exists in the blood, saliva, and in other fluids of the body. It is not volatile, and cannot act through the unbroken skin or until it is brought into contact with a wound or an excoriated surface. The poison acts on the sensory nerves, and hence the symptoms are mostly nervous, resembling tetanus. It has been supposed that the poison causes a neuritis of a peripheral nerve on which it has worked, and that the mischief spreads to the medulla oblongata and cerebrum. Very often the poison remains latent at the seat of injury, the wound cicatrises, and the ill effects are not marked until suddenly the poison spreads in the centripetal direction.

Cause.—The most common cause is the bite of a mad dog or of some rabid animal, as the wolf, the fox, or the cat. An ulcerated or abraded surface is necessary, and a bite is far more dangerous on a bare portion of the skin than on a portion covered by clothes, which remove the poison from the teeth of the animal. A certain predisposition is also necessary for the development of the disease.

Post-mortem appearances.—The rigor mortis is intense and of long duration; there is extensive hypostatic congestion of the lungs, and of all dependent parts, as the posterior parts of the larynx, œsophagus, pharynx, and the brain. There is early putrefaction, so that blebs form soon after death. Lymph is found deposited on the mucous membrane of the larynx and pharynx, and the bronchi contain frothy mucus. The brain and cord contain serous fluid. The tonsils and the glands at the root of the tongue are much swollen.

Symptoms.—The wound heals more or less rapidly, and there is a period of *incubation* before the effect of the poison shows itself. This period may extend from ten days to twenty months, and varies with the age and constitution of the patient, and depends upon the virulence and upon the quantity of the poison introduced into the system. The period is shorter in young persons than in adults and in old age.

Invasion or prodromic stage.—For a day or two before the outbreak of the disease, a peculiar pricking sensation is felt over the site of the cicatrix, accompanied with restlessness, depression of spirits, and disturbed sleep. The bite or the cicatrix has been known to assume a livid colour, and discharge a yellowish ichorous fluid. It may also become swollen and very painful. The pain often extends in the course of the sensory nerves. This stage is often known as the *melancholic stage*, and is characterised by great anxiety, feverishness, shiverings, pain in the epigastrium, great thirst, and want of sleep. The patient is pale, anxious, very restless, and indisposed to work or talk. The pulse is very frequent, there is loss of appetite, often nausea, followed by vomiting, with disinclination to swallow fluids, and there is tendency to priapism and seminal discharges. The patient sighs repeatedly without cause. Very often he dreads the approach or onset of the malady. The respiratory functions are disturbed; there is spasmodic breathing. Having lasted for two or three days these symptoms are, sooner or later, followed by a *stage of excitement*, or the second stage, during which the patient complains of cramps in the muscles of the pharynx, and of the thorax, or in the diaphragm. The patient looks wild and suspicious, his eyes protrude, but though inclined to be talkative like a maniac, he is quite sensible. He has also hallucinations, and often attempts to injure himself or others. He has great thirst, but is unable to swallow fluid; his mouth and fauces are dry, and there is a constant flow of viscid saliva, which he spits or hawks about with a noise resembling a bark. Retching is a common symptom, and accompanies a feeling of suffocation. The disinclination for liquids merges into a dread, and he cannot swallow fluids of any kind. While attempting to drink he often makes a sudden gulp, but without swallowing any fluid, and ejects spasmodically from his mouth whatever he has taken into it. During the act the muscles of deglutition and respiration are thrown into violent spasm, attended with general tremors or shudderings. These paroxysms are often revived even by the sight of fluid. At first solid food can be swallowed without difficulty or spasm. The skin becomes so sensitive that a draught of air or contact with anything, even the weight of bed clothes, induces attacks. The glare of light or mental excitement throws him into violent spasm. The patient is then thrown into violent excitement, and cannot be controlled. He begins to bite or scratch or kick, and may even attempt to kill himself. During the interval the patient is quite sensible, and aware of his condition and previous behaviour. The fits last several minutes, seldom half an hour. Gradually the fits become less violent. With all these dreadful symptoms sexual excitement continues, and he passes urine frequently. As the case advances there is great restlessness and mental anxiety; the patient feels very feeble; the skin is cold and clammy; the pulse small, irregular, and frequent; his voice is hoarse; there is a constant supply of saliva, which is ejected in all directions, and which often contains small animalcules, which lively imagination has pictured to be the puppies of dogs. The whole muscular system contracts spasmodically, and there are convulsive tremblings; there are also snapping motions made with the jaws which resemble the bitings of a dog. This state continues from a few hours to two or three days, when signs of general paralysis set in. The respirations are more hurried and shallow, and at length the patient becomes delirious, and dies either of sudden asphyxia or of exhaustion. Death rarely occurs during the fit.

Pathognomonic symptoms.—There is increased sensibility of the skin and of the senses generally, and attempts to swallow liquids are attended with pain; spasmodic contractions of the muscles of respiration and deglutition are felt, and there are restlessness, sleeplessness, and tendency to commit insane acts.

Treatment.—Few satisfactory results have been obtained. Still, attempts must be made to remedy the evil by at once excising the wounded part, the immediate surrounding raw surface to be destroyed by caustics, as hot iron, nitric acid, acid nitrate of mercury, nitrate of silver, or potassa fusa. The sore caused by the caustic should be kept suppurating for some time. The hyperæsthesia may be relieved by narcotics and anæsthetics. The patient should be prevented from hurting himself, and further inoculation of any wounds by his saliva should be guarded against. Internally mercury in large doses, pushed to salivation, and extract of belladonna have been tried from time to time. The disease once established invariably ends in death. Urgent symptoms may be combated. Thirst is relieved by ice if it can be swallowed. Inhalation of chloroform and hypodermic injections of morphia afford some relief to the spasms. The hypodermic injection of curara ($\frac{1}{10}$th to $\frac{1}{5}$th of a grain), at intervals of three or four hours, has been found to palliate the symptoms, and to afford more relief than any other remedy which has hitherto been tried.

Glanders and Farcy.

These infectious diseases are transmitted from the inferior animals to man. Both are due to the same poison, the name of the disorder varying with the locality in which the lesions are manifested. The poison is received from the animals possessing an undivided hoof, as horses, mules, and asses. The disease when manifested in the nasal cavities is called glanders, when in the lymphatic glands, farcy. It is a kind of malignant fever, of a highly contagious character. The disease once produced in man is transmissible to other persons. The poison, like the virus of syphilis, cannot be recognised under the microscope, or by means of chemical analysis. Its presence in the human body is demonstrated by its effects. It is contained in the nasal secretions, and also in the urine, sweat, saliva, and blood. Coachmen, grooms, and veterinary surgeons are most frequently attacked. The poison enters the body by the skin or mucous surfaces, an abrasion or wound appears to be unnecessary.

Morbid appearances.—The effects of the poison are manifested on the skin first as an eruption of tubercles or small nodules. These are hard at first, but soon degenerate and disintegrate and form abscesses and ulcers.

The poison at first leads to irritation and inflammation of the skin, after a time there is proliferation of cells in the form of nodules. In recent cases the nodules consist of small delicate cells, with many nuclei. Gradually the cells increase in size and the nuclei become more distinct. These cells soon degenerate and form caseous masses or pus, the separation of which causes ulcers or gangrene. These lesions are also found on the nasal mucous membrane, which exhibits numerous ulcers and assumes a worm-eaten appearance. The disease extends into the deeper structures, and thus the nasal bones and cartilages become denuded and carious. The subcutaneous areolar tissue and muscles are often the seat of glanderous nodules.

In farcy, tubercular nodules appear on the skin, and the lymphatic and other glands become inflamed and form small tumours, known as "farcy buds" or "farcy buttons." Both diseases appear in a chronic as well as in an acute form.

Symptoms.—The disease is divided into three stages. The incubation stage varies from five to seven days; the period is longer where the poison is not introduced through any abrasion or wound. Where the disease is the consequence of an abrasion, the symptoms are at first generally local, the subsequent febrile phenomena varying with the intensity of the local mischief. The local symptoms are: the wound inflames, the inflammation extends to the neighbouring lymphatic glands, and they remain enlarged, knotty, swollen, and painful. The skin around the abrasion assumes an erysipelatous redness, and there is great œdema. Blebs form upon the skin surrounding the wound or about the inflamed lymphatic glands; very often pustules appear containing ichorous pus. In other cases the period of invasion is marked in the absence of local manifestations by the existence of fever and other constitutional disturbance and various subjective symptoms, such as pains of a rheumatic character in the trunk, back, or limbs, with dyspnœa and tightness of the chest, headache, depression of spirits, &c.; vomiting and diarrhœa are also present. Soon the forehead, eyelids, nose, and cheeks become swollen, red, hot, dry, and shining, and the nose dark-coloured and perhaps gangrenous. A thick discharge of a deep yellow colour now begins to flow from the nostrils, this becomes sanious and offensive. Hard pustules appear on the face and limbs. The temperature and pulse are high, the respiration hurried and difficult. The pustules break, and the skin around them becomes purple. Delirium ensues and is accompanied by profuse sweating and diarrhœa. Death takes place with all the symptoms of exhaustion. Recovery is very rare.

In chronic glanders or farcy the symptoms are for the most part local, consisting of inflammation and abscesses of the lymphatic glands and subcutaneous cellular tissue. The patient may recover, but should the abscesses be very numerous a condition resembling that of pyæmia becomes developed. The disease sometimes runs a very chronic course, the nodosities and cutaneous ulceration continuing for several months.

Diagnosis.—The appearances somewhat resemble those of carbuncle and malignant pustule. In carbuncle, however, the induration is large and painful, and malignant pustule is usually for some days a purely local affection. The discharge from the nose is characteristic of glanders, but this symptom in chronic cases is not always prominent. Cancrum oris or noma may present some features resembling glanders, but this disease is almost exclusively confined to children, and is not characterised by any nasal discharge.

Acute glanders and acute farcy are almost invariably fatal. A few recoveries have taken place from chronic glanders, and in chronic farcy the prognosis is favorable.

Treatment.—The prophylactic treatment is all-important. An animal affected with glanders should be at once destroyed. If inoculation should accidently take place the spot should be immediately cauterised with a red-hot iron or potassa fusa. For the treatment of the disease in the human subject no special remedies can be suggested. The nostrils and sores should be washed thoroughly and frequently with carbolic-acid lotions. The strength should be supported by nourishing diet and stimulants. Various writers have recommended arsenic, strychnia, the hyposulphites and the perchloride of iron, as internal remedies.

SNAKE-BITE.

In India bites from venomous snakes are very frequent and generally fatal. The symptoms vary with the kind of snake. The bite of the snake known as kurreehar causes blood to flow from the mouth and with the urine at once, and the pain of the part bitten is severe. The bite of the sungehoor (cobra) is also very painful, and the poison is the most virulent of all. The patient immediately after being bitten becomes wholly or partially insensible. The part becomes much swollen, the temperature somewhat increased, and some pain is complained of. The swelling rapidly extends upwards. Vomiting follows. The patient becomes intensely depressed, and his face pinched and shrunken, and there is loss of voice. The pupils are dilated, the pulse frequent, feeble, and occasionally intermitting. Diarrhœa is common, and drowsiness is a universal symptom, as is also giddiness. The breathing is hurried and often oppressed. In some cases the parts bitten become black and the body turns red. In others the whole body turns black, the eyes become yellow, and froth flows from the mouth. Death occurs at varying intervals; the patient may be struck down in few minutes by the poison, or may live several hours.

Treatment.—In many cases of snake-bite no venom is present, but the patient is frightened considerably, and the prostration is due to fright rather than to the effects of the bite. Such cases rapidly improve under judicious management. In India, a tribe called Jogees generally charm the wound, and then administer purgatives, followed by opium. Where Jogees are not to be found, people usually apply to the wound the root of *Aristolochia indica* (isurmool) or gogaree wood, ground up and mixed with water. A kind of stone called zur mora is also rubbed and placed on the wound. The superstition of killing a white cock and placing the skin of the tail on the wound is still prevalent in India. The free scarification of the wound, and the application of ammonia, nitric acid, or nitrate of silver, and the exhibition of ammonia and other stimulants internally, have been recommended, and ought to be tried. There is, however, but little prospect of success from any method of treatment if the poison has really entered the circulation. If the patient be bitten on a finger or toe, a ligature *immediately* applied above the wound might be of service, but the absorption of the poison takes place with such rapidity, that after an interval measured by seconds rather than minutes, no good result could be expected from any such attempt. No antidote to snake-poison has yet been discovered; the hopes once raised with regard to the intravenous injection of ammonia have been disappointed. But if the patient survives the first effects of the poison, ammonia and other diffusible stimulants will help to promote recovery.

FEVER.

The word "fever" means simply preternatural heat. The normal temperature of the body is 98·4°, and when this standard is exceeded by more than one degree fever exists. Such rise in temperature may be due to very slight causes, as exposure to sun, fatigue, irregularities in diet, &c., or may be produced by an external injury. In infectious and other fevers the increased heat is due to the changes produced by the action of the contagium or of the malarious poison. Every suppuration is associated with some rise of temperature, but in works on medicine, as well as in every-day language, the term fever is applied in a special sense to those diseases in which the rise of temperature is a main and not a subsidiary incident, and in which it seems directly due to the introduction of a poison into the system.

MAIN DIVISIONS.—These are two. 1. The fever is termed Idiopathic or Essential when not due to any local mischief; and 2, Secondary or Symptomatic when dependent on some acute or chronic inflammation.

Essential fever.—In this form the fever appears first, and any local affection that may occur is generally developed as a complication. Whenever an idiopathic fever and a local lesion occur simultaneously, the intensity of the fever is out of proportion to the extent of the local mischief. In the essential fevers there are distinct stages. These fevers constitute a group of disorders included under the head of zymotic diseases. The word zymotic is derived from the Greek *zumosis*, signifying fermentation. All zymotic diseases arise from the introduction into the blood of some unknown special poison, which under favorable circumstances is capable of increase and multiplication. It is impossible to separate by any definition such fevers from other zymotic diseases, as diphtheria, mumps, whooping-cough, and influenza, in which an unseen poison is introduced, or from glanders, farcy, hydrophobia, and snake-bite, in which an obvious poison is directly inserted into a blood-vessel. For the purposes of practical convenience it is better to consider diphtheria, mumps, whooping-cough, and influenza, in connection with the organs or tissues mainly affected. Other zymotic diseases, as glanders, farcy, hydrophobia, have been treated under "constitutional diseases." The remainder occur in different forms, each having its own special cause. For convenience they are grouped under two heads, Continued fevers and Periodic fevers.

Continued fevers.—These are easily separated into (*a*) exanthemata or the eruptive fevers, and (*b*) those without a characteristic rash. The exanthemata or the eruptive fevers include chicken-pox, scarlet fever, smallpox, cow-pox, and measles. Other continued fevers are typhus fever, typhoid fever, and relapsing fever. The periodic fevers are the intermittent and remittent fevers. It sometimes happens that different kinds of essential fevers are found blended together in one case. Thus a continued and a periodic, as the typhoid and remittent fevers, may exist together.

All essential continued fevers run a definite course; they rarely occur more than once during life. Some of them are contagious, and they are propagated by some atmospheric influences. They are called epidemic when they spread simultaneously over a large area irrespectively of the propagation of the disease by contagion; they are known as endemic when peculiar to a certain locality. They are called sporadic when stray cases are met with of a fever due to contagion or to epidemic influence.

Fever poison.—The poison may be introduced from without or generated within the system. In whichever way it is introduced nothing definite is known as to its further action upon the system. Some believe that the poisonous agents are certain low organisms or germs. These when placed under suitable circumstances grow and multiply and rapidly pervade the organism. Others have supposed that contagia are vegetable parasites, that each acute specific disease is due to the action of a special parasitic fungus. The action of this fungus is thought to resemble that of the yeast plant which splits up sugar into carbonic acid and alcohol, and itself also grows and multiplies at the expense of nitrogenous substances in the infusion. The fever-contagium or the poison is also capable of multiplication or increase in an indefinite manner. It has been ascertained that the poison of one kind of fever produces that disease only and never any other. The zymotic poison is a ferment and various essential fevers are the products of or connected with these fermentative processes. In the case of smallpox or cow-pox, the poison or the contagium is found in the granules contained within the pustules. It acts upon some unknown constituents of the blood, multiplies rapidly and thus sets up fever. Similarly, in the case of relapsing fever, there exist in the blood vegetable germs, or moving spiral filaments or parasites, of $\frac{1}{1500}$ to $\frac{1}{500}$ of an inch in length ; these find a suitable nidus in some constituents of the blood, multiply rapidly, and thus set up fever. Similar specific parasitic growths have been detected in connection with many other fevers. In splenic fever the contagium consists of peculiar organisms in the blood, lymphatic glands, and spleen ; they are best noticed during the height of the disease. These parasites are known as bacteria or bacilli anthracis ; they are motionless, rodlike, about $\frac{1}{5000}$ inch in length.

On the other hand, a numerous class of observers have come to the conclusion that bacteria are not the efficient agents of contagious diseases, but that these latter are due to the action of a *contagium vivum*—a specific morbid agent. Much has yet to be discovered with regard to the causation of the acute specific diseases. The contagium, whatever it may be, first gains entrance into the body, where it remains dormant for a time (latency), but sooner or later it causes a decided rise of temperature known as fever. The poison develops most rapidly in persons predisposed to its influence. Thus it affects the weak and debilitated more rapidly than the strong and robust. The fevers due to specific causes are in a large proportion known as infectious or contagious fevers. The contagious fevers are typhus fever, scarlet fever, relapsing fever, measles, and smallpox. Diphtheria is classed among the infectious diseases, and is also typically contagious. Other fevers are purely miasmatic, and include ague and continued fevers. There is an important difference between contagious fevers and the specific ague fevers. The contagious fever spreads and reproduces itself in organisms infected by it. Malaria, on the other hand, is not reproduced in the body of an ague patient. There is no soil favorable to the development or increase of miasmatic poison. It is never carried by ague patients to other places and transmitted to other persons.

Admission of the poison into the blood.—The poisons of fevers enter the system in various modes and by different routes in different cases. Some are conveyed from without either with the air we breathe, or with the food or drink we take, and thus act first on the alimentary canal. Some poisons, notably those of scarlet fever and smallpox, attach themselves to clothes and may be carried to considerable distances.

Effects of the poison.—In cases of inoculated smallpox, about the fifth day a pimple appears at the point of inoculation, the neighbouring lymphatic glands show signs of irritation, and two days afterwards febrile excitement sets in followed by the appearance of the general eruption. In vaccinia the same developmental changes occur, but there is no rash. The poison enters the blood and through its medium becomes diffused through the system. The contagia infect those parts of the body which are predisposed to their influence. Thus we find various specific lesions characteristic of each specific disease. In enteric fever the lesion is found in the intestines. In eruptive fevers or exanthemata the lesion or rash appears in many cases first on the skin ; in some the tonsils, in some the larynx, and others the alimentary canal generally is affected.

The progress of the poison.—In eruptive fevers the poison undergoes various developmental changes. An extremely minute quantity of it results in an infinitely large amount of the poison, and thus indefinite multiplication takes place. In other fevers, as in ague, there is a period when the development of the poison ceases, and the febrile excitement is followed by remission or intermission.

Ways of elimination.—The poison is expelled from the system in different ways, and the method of discharge is connected mainly with the seat of special lesion. The discharge takes place at different periods, and from different surfaces in different fevers. Thus in malarial fevers it takes place by the skin, lungs, or by the bowel. In whooping-cough, influenza, and measles it is given off from the respiratory surfaces. In scarlatina the contagium is given off from the throat and epidermis; in typhoid fever through the alvine excretions.

Terminations of fever.—The majority of fever-cases end in *recovery.* The abatement, subsidence, or defervescence of the febrile state takes place in a sudden or in a gradual manner. In the former case the fever is said to terminate by *crisis,* in the latter by *lysis.* In typhus fever the transition from unfavorable to favorable symptoms is very marked, the fever subsides with an astonishing rapidity. The termination of typhoid fever, on the other hand, is gradual, and takes place therefore by *lysis* and not by *crisis.* In recovery from relapsing fever there is usually a well-marked crisis, which is characterised in the majority of cases by copious perspiration. In scarlet fever, smallpox, and measles, the termination is gradual and more or less indefinite. The resolution of febrile symptoms is often attended by increased discharges from the excretory organs, but these discharges are more probably the result than the cause of the cessation of the fever.

The behaviour of the contagium after it is eliminated.—In influenza the poison diffuses very rapidly. In typhus it clings round the bed-clothes, and is destroyed by dilution with the atmospheric air. The smallpox poison can be retained for years. In enteric fever the poison escapes with the fæces, it is probably inert at first but after a time undergoes some developmental changes and acquires poisonous properties. The poison of scarlet fever is especially contained in the skin which peels off at the close of the attack. These fragments of epidermis retain their virulence for indefinite periods; they often remain attached to clothes, bedding, &c., and give rise to the so-called "spontaneous" outbreaks of the disease.

History or stages of fever.—In certain points all fevers are alike; they are all, as is said above, supposed to be due to a poison somehow introduced into the system. A period succeeds in which the poison may be supposed to be developing or apparently remaining dormant for a time; this is called the stage of *incubation* or latency, or a period of depression. It is supposed to have a given length for each fever, but, except in the case of smallpox, its duration is a matter of hypothesis, though no doubt it can be approximately determined in many cases. Its symptoms are much the same in all fevers, and are—an indefinite languor, a sense of not being quite well, dejected spirits, loss of appetite, irregular action of bowels, and abnormal secretions. The stage of incubation is succeeded by what is called the period of excitement, or the first day of fever, and thus begins the stage of invasion, the primary fever, the actual disease. In every case of fever this first day, from which and not from the date of infection, every fever's duration is computed, is marked by the occurrence of a single rigor, or of several rigors. Rigors are due to the fact that in the early stage of fever, owing to undue contraction of the cutaneous capillaries, there is less blood in the vessels of the skin, and also less amount of heat than is generated in the body. In some cases rigors are felt in a limited part of the body, as in the back, shoulders, or legs. In children vomiting or convulsions generally take the place of rigors. A rigor is defined to be that condition of the body in which there is a general sense of cold, while the thermometer shows an increase of the temperature of the body. A man who falls into freezing water, shivers, has goose-flesh, has increased activity of the kidneys, all of which symptoms occur in a man who has a rigor as a symptom of a fever, but with this difference, that the temperature in the mouth of a man who has fallen into cold water is 98·4°, while that of the febrile patient is one or several degrees higher than this. Besides chills or rigors other initial symptoms are—pains in the back and limbs, frontal headache, an elevated temperature, heat of skin, frequent pulse, and defective secretions. These symptoms last for a longer or shorter time, the period varying with each fever. In non-eruptive fevers this period is indistinctly marked. In eruptive fevers the stage of invasion is followed by a period of eruption, and a special character of the rash is manifested.

In these fevers the rash appears on a definite day, usually on a definite part of the body, and has a definite character. It spreads, and may disappear, but in some fevers it returns in crops. In some cases, as in smallpox, secondary fever sets in after a time or during the suppurative stage, just as in the case of a wound, when suppuration begins to take place secondary fever also appears. In a large proportion of cases the stage of invasion is often associated with various complications. After the period of invasion the disease goes on for a time, which is not always quite definite in length : all the symptoms then begin to subside, and the stage of decline or subsidence, or defervescence, begins ; this stage is followed by convalescence. In some fevers the stage of decline terminates abruptly or is complete in a few hours (crisis) ; in others the fever passes off gradually (lysis). These modes of termination have been already referred to.

Convalescence succeeds the stage of decline, and, as in other diseases, there are peculiar sequelæ. In some cases the decline is accompanied with symptoms of collapse to be followed by death.

Febrile phenomena.—In essential fevers these include : (1) Abnormal heat of skin ; (2) disturbance of the circulatory, nervous and respiratory systems ; (3) changes in the blood and tissues ; (4) changes in the secretions and excretions.

1. *Heat of skin.*—This is best explained as due to some infectious poison introduced from without. The poison leads to excessive waste of tissues, to congestion of internal organs, and to disturbance of the nervous system, chiefly the sympathetic, by irritating directly or indirectly the sensory nerves. The disturbance to the sympathetic leads to variations in the action of the heart and to contractions of blood-vessels. It also leads to abnormal conditions of the ganglionic nerve centres, and thus its effects are manifested on the secretions and by the enlargement of the liver and spleen. Physiologically considered a certain amount of heat is essential for the maintenance, growth, and development of the body. It is also necessary for the due performance of its various functions. The circulatory, the nervous, and the respiratory systems require heat as an essential element for their functions. The maintenance of a uniform temperature of the body, or of animal heat, depends upon changes going on in the body itself. Nutrition by food, and the discharge of energy by exercise, are the efficient causes of heat. Heat is the complement of work and nutrition. If a part of the organism does not work, and its supply of blood is limited, it will become cold.

The normal temperature of the body is the balance between the amount of heat developed and the amount of cooling effected. The cooling is effected by breathing cold air during respiration, by perspiration through the skin, by evaporation and radiation of heat from the surface of the body. All these processes are under the influence of the nervous system. This circulation of the blood has a large share in the equalisation of the temperature of the body. Every time we move the muscular contraction develops heat by oxidation. During violent physical exertion the blood becomes warmer and flows with greater rapidity, an increased supply is sent to the capillaries of the skin, the heat of the surface and extremities is increased until it equals that of the internal organs. At the same time there is profuse perspiration through the skin, and as a result of evaporation and radiation the surface becomes cooled. In persons with feeble circulation the temperature of the internal organs is considerably greater than that of the surface of the body, and by further evaporation and radiation of heat the surface of the body and extremities is rendered still colder.

In fever the cutaneous surface is found in three distinct and successive stages. The skin during the stage of depression is pallid, dusky, and cold. This is owing to the fact that during the early period of fever the internal organs are preternaturally hot, while the vessels of the limbs and face are so contracted as to allow very little blood to reach the surface. During the stage of excitement the vessels dilate, there is a rush of blood to the skin, and it therefore soon becomes pungently hot and dry. During the stage of subsidence the circulation of blood becomes less forcible, there is radiation and evaporation from the cutaneous surface, and the skin is soft and cool, and generally moist or covered with perspiration. The heat of skin is also marked by paroxysms or exacerbations occurring once or twice or several times during the twenty-four hours. In unfavorable cases the heat of skin varies in different parts of the body at the same time. The heat is indicated by an increase of temperature from the normal degree, or 98·4°, to as high as 110° or 112°. Its origin is supposed to be increased oxidation of the tissues owing to the presence of some poison in the blood. Pungent heat of skin or hyperpyrexia gives rise to degenerations of the parenchymatous structures of the vital organs, and especially of the heart, liver, kidneys, blood-vessels, and muscles generally. This effect is produced by a prolonged high temperature.

Range of temperature.—The average temperature in health ranges from 98·4° to 99°. In infants it is somewhat higher than in adults. It is raised by bodily exercise and by ingestion of food. In the tropics the temperature of the body is somewhat higher. It may, consistently with health, reach 99·5°, or even 100°. External temperature, therefore, influences to some extent the temperature of the body. When the body is immersed in cold water at a temperature of 60° to 70°, or freely exposed to cold air, the general heat of the body is rapidly diminished, and in fevers the temperature, after half an hour's immersion, falls several degrees. The temperature is also lowered by mental disquietude, by grief, by sudden fright, and by sudden or profuse discharges as vomiting or diarrhœa. The temperature is also subject to normal fluctuations during the twenty-four hours. Towards evening it begins to fall, and at midnight, or an hour afterwards, the temperature is about 97°, or even slightly lower. It remains at this point for a few hours, and then gradually rises to its maximum of 98·4° to 99°.

In disease the temperature varies. In idiopathic fever, and in other fevers due to some local affections, the temperature of the body generally goes beyond 103°. During the period of defervescence the temperature falls to the normal range, or even far below it, such a fall being only temporary.

In cholera, in pernicious intermittents, and in cases of collapse from these and other similar diseases, the temperature is considerably lowered. In asthenia, in chronic and wasting diseases, in profuse discharges, in uræmia, and in alcoholic coma, after prolonged exposure to cold, and in cases of starvation, the temperature is extremely low before death. In acute tuberculosis the temperature continues high till after death. In disordered conditions of respiration, as chronic bronchitis, and in long-continued cases of asthma, and in persons suffering from fatty heart, the temperature is generally below that of health. Observations should be taken twice during the day —between 7 and 10 a.m. and between 3 and 7 p.m. A very high temperature and a very low temperature both indicate disease. Very high temperature (above 104°) in fevers, if persistent for several days, indicates a very grave condition; and no case of fever in which the temperature has reached 110° has been known to recover. The persistent high degree of heat indicated by the thermometer denotes either the hyperpyrexia, or the setting in of some organic complications. A fresh rise of temperature, after it has once begun to fall, or remained low for some time, indicates the approach of a relapse, as in the recurrent variety, or of some serious complication as diseases of the lungs, liver, kidneys, or the brain. Very sudden rise or a sudden fall of many degrees of temperature is of very grave import. It is always a good plan to keep a graduated sheet of paper at the bed-head, so that the curve formed by the several points of daily temperature may be accurately traced. In moderate fever the temperature seldom exceeds 104°. In fever of great intensity it reaches 105° or higher. When beyond 105° hyperpyrexia is said to exist. The temperature is always taken by the clinical thermometer, which is essential to the satisfactory determination of the existence of any rise. The sensation by the touch is often deceptive; during the cold stage of ague the patient suffers from a sensation of chilliness over the whole body and the surface is cold to the touch, while the thermometer placed in the axilla indicates a rise of temperature to 102° or 103°. In the collapse stage of cholera the temperature in the axilla may be only 90° while the temperature of the rectum or vagina is found to be many degrees above the normal. By the systematic use of the thermometer in every case we determine the presence and intensity of fever heat in the body. By recording our observations we may also determine the existence of a disease of which no obvious signs had been before detected. We are also assisted by the daily use of the thermometer in a fever patient in determining the character of the complaint. Its presence is known by a rise of temperature above 98·4°. Its intensity varies. In fatal cases the temperature rises very high. A temperature in fever above 105° is of serious import; in fatal cases of typhus the temperature generally rises two or more degrees before death.

There is no definite relation between the temperature and the frequency of the pulse in fever, but it has been stated, in a general way, that each increase of 1° above 98° corresponds with an increase of about eight beats per minute. On the other hand, the temperature may be very high and the pulse only slightly quickened, or the temperature may be low and the pulse rapid. In the latter case cardiac weakness is indicated.

Character of fever heat.—Different fevers have different characters as regards temperature. In ague there is a sudden rise from 98·4° to 103° or 104°. The rise takes place generally at noon or towards evening, and on several successive or alternate days, in a few cases after three, five, or seven days. The rise may denote an invasion stage as in the intermittent, or an exacerbation as in the remittent fever. In mild cases the temperature falls in a few hours and becomes normal or even lower. In intermittent fever the temperature often ranges between 99° and 100°, with an occasional rise to 103° for several successive or alternate days. In remittent fever the temperature rises to 105° or 106° and remains so, with slight variations, for several days, during which time it seldom falls below 101° or 102°. The fall of temperature takes place at about two in the morning and the rise at three in the afternoon. In typhoid fever there are morning remissions and evening exacerbations, with a steady difference of about two degrees between the morning and evening temperature. In the early stage, also, there is a gradual daily increase of temperature, a degree higher being reached each morning and evening. The maximum evening temperature is usually attained on the sixth day and is generally 104° or 105°. In relapsing fever, the thermometer range is diagnostic of the recurrent variety of fever. In it the temperature generally is higher towards evenings than in the morning. At the commencement, during the hot stage, the temperature is as high as 103° or 106°, and continues so for four or five successive days, when it suddenly falls about 8° or 10°. For two or three days afterwards the temperature may stand as low as 97° or 95°; and this condition may continue for ten or twelve days, the temperature rising 1° or 2° towards evening. At the end of that period, and in the evening generally, the temperature once more suddenly rises to nearly the same height as on the first occasion. During this time the temperature follows a similar course, but the rise is of a shorter duration, lasting only for one or two days, when it suddenly falls from 106° down to 95° or 97°, and continues low for several days pending complete recovery or a third relapse. In fever cases where the temperature remains between 102° and 104° for several days, complications, as diseases of the liver or the lungs, are apt to occur. In typho-remittent fever the thermometrical course is peculiar. In unfavorable cases the temperature continues between 103° and 105° for several days, and the variations occur at irregular hours.

Selection of the instrument.—For convenience it should be one that can easily be carried in the pocket, Those instruments with magnified indices are preferable to others. The thermometer should be a self-registering one, and before using it the registering index should be brought down into the clear part of the stem, by rapidly swinging the instrument.

Method of application.—The bulb of the instrument should be kept in close contact with the skin in the axilla from five to ten minutes, taking care that the clothes do not come in the way. It may also be placed under the tongue or introduced into the rectum or vagina. The axilla is to be preferred as the most convenient seat for application. If there be perspiration it should be wiped away before the instrument is applied. In dangerous cases of fever, where we are required to take the temperature while the patient is in a cold bath, the thermometer should be put into the rectum or into the mouth. As it is very inconvenient in children and in delirious adult patients, and in those who are comatose, to put the instrument into the mouth and to keep it there for a sufficiently long time, choice may be given to the axilla, or the rectum or vagina. It must be remembered that the temperature in the rectum or vagina is always a degree higher than in the axilla.

Disturbance of the nervous system.—In fevers generally the nervous system is considerably disordered. During the onset, or the period of depression, the patient complains of languor, muscular debility, and chills or rigors alternating with flushes of heat, a general soreness, disinclination to work, with occasional headache, vertigo, muscular pains, restlessness, and slight nocturnal delirium; sleep is often wanting, or when obtained is uneasy and unrefreshing. There are sometimes violent mucsular movements with yawning and chattering of the teeth. In some fevers there may be extreme prostration from the first. Generally the prostration comes on during the unfavorable progress of the disorder, and is then accompanied with violent or low muttering delirium, or with muscular twitchings, subsultus tendinum, or convulsions. Stupor or coma, or unconsciousness sets in in advanced cases with great exhaustion, and may be due to the blood becoming surcharged with effete matters, or to the poison of fever, or to the pent-up alvine or other secretions.

Disturbance of the circulatory system.—In ague the character of the pulse varies with the stage of fever. During the cold stage it is small and hard. During the hot stage it is large, hard, and bounding, and during the sweating stage it is large and soft. In this, as in any other fever, its frequency generally increases with the temperature, and may reach 120, or even 140 or 150 or more. With a frequent and bounding pulse there is dilatation of the arteries and the temples throb. The dilatation of the arteries is the result of an influence transmitted through the vagus and the sympathetic nerves. The proportion in the rise of temperature and pulse is one degree of temperature to an increase of eight beats in the pulse. This rule is liable to variations. Thus in nervous people the pulse is generally very frequent, and out of proportion to the temperature. Other variations have been already alluded to.

Respiratory system.—During health the respirations are about 18 to 20 in a minute. In fever they are often increased, and in severe cases they rise to 40 or 50 in a minute. This rise may be due to imperfect aeration of blood, owing to the latter being saturated with fever poison, or to rapid destructive waste of tissues, or may result from lung complications. In some fever cases the respiration is normal although the temperature may rise very high. When prostration sets in and the heart's action is much impaired, the respirations may sink to 12 or even 8 in the minute. This great diminution has been observed in cases of typhus. In hyperpyrexia the respirations are usually very rapid and shallow. The patient is required to inspire more air; the mouth is therefore open and the alæ nasi are widely dilated.

Changes in the blood.—In fevers the blood is slow in coagulating and is darker and more fluid than natural. Its alkalies, albumen, salts, and red corpuscles are diminished, and the white corpuscles increased. The red corpuscles are destroyed in considerable numbers and converted into pigment-granules. This disintegration is the cause, in part at least, of the increase of colouring matter in the urine. The fibrin is increased in some cases and diminished in others. If during the invasion stage of a fever, or at a temperature of 103°, blood be examined under the microscope, it is found to present the following characters—slow but uniform coagulation; medium cloudy or clear; plasma rather turbid, sometimes clear; blood-corpuscles aggregating in heaps, some star-shaped; no specks.

At a still higher temperature, or at 104°, some additional characters are noticed. Blood plasma clear or clouded. Distinct and close set fibrillation, active protoplasmic movements of the white corpuscles, which are often granular. Red corpuscles crenate and misshapen. In relapsing fever numerous mobile filaments, corresponding in thickness to the finest filaments of fibrin, and of a length varying from the diameter of 1½ to that of 6 red blood-corpuscles, have been found in the blood.

Destructive tissue changes.—During health no loss of tissue takes place, for the discharges from the various excretory organs are exactly counterbalanced by the nutritive materials introduced into the body. During fever the waste of tissues goes on rapidly owing to the continued high temperature. There is also an abnormal condition of the (sympathetic system) ganglionic nerve-centres leading to abnormal secretions and excretions, and the waste of tissues is greater. In fevers the tissues have a tendency to become converted into substances of a low organisation, the muscular tissue, fat, nerves and bones, and even the red corpuscles of blood, undergo a form of degeneration. In many fevers the glands of the body become congested and enlarged, owing to the increase in the size and number of their cells. This enlargement is not confined to the lymphatic glands, but is seen also in the liver and spleen. In typhus inflammatory swellings of the parotids and submaxillary glands are not uncommon. The enlargement of the glandular organs is caused by the increased amount of work thrown upon them. Owing to undue waste of tissues and to the consumption of very little food, the patient rapidly loses flesh and becomes emaciated. When the patients are obese emaciation is less rapid, the extra fat in the body is first consumed, and wasting of the other tissues does not take place to the same extent.

The final result of the changes in the blood and tissues.—The final result of these changes is manifested in the excreta furnished by the lungs, bowels, kidneys, and the skin. These excreta determine exactly the amount of heat which has been developed and the destructive oxidation which has been effected. The albuminous elements of the tissues break down into circulating albumen, which is transformed into urea, and other nitrogenous excreta. The amount of carbon given off by the lungs is increased, for although the percentage of carbonic acid in the expired air is less than in health, the actual quantity of air expired is increased owing to the frequency of respiration.

Alterations in the secretions and excretions.—The secretions and excretions of the body are altered in quantity and in quality. The functions of the stomach and bowels are disturbed, as shown by the viscidity and scantiness of the saliva, and scantiness of the intestinal and urinary secretions. The tongue is furred, mouth pasty or parched; there is great thirst. Much of the troublesome thirst in fevers is due to dryness of the mouth and throat. Fever patients often drink more water than is really good for them, and thereby increase the derangement of the stomach and bowels. The urine is scanty, of a high colour, owing to concentration and to the presence of the colouring matter of the blood, of strong odour, and of high specific gravity, and contains excess of urea and uric acid. The urea may be twice as much as is excreted during health. The chlorides are much diminished, or may be absent. The salts of potash are increased; albumen is present if the temperature is high for many days; it is often found in typhus, less frequently in cases of typhoid fever. Notwithstanding the scantiness in the quantity of secretions and excretions of the body, it has been shown that the amount of solids excreted by the kidneys during fever is actually increased, and the amount of urea is larger even before a very high temperature is manifested, and continues so till the convalescence is established. In fever the excretion of increased quantity of urea is due to destructive oxidation of tissues, and to disintegration of blood cells. Not so in health, where the presence of urea in the urine is due to the changes in the albuminous food. In fever the salts of potash, which form one of the constituents of blood and tissues, are increased in the urine, and salts of soda, which generally exist in the albuminous food, are diminished. During convalescence the salts of soda are increased, whereas the salts of potash are diminished. The heavy offensive odour of the breath in fever shows that it contains a large amount of decomposing organic matter, and that the blood also contains much of excrementitious material. In sympathetic fever due to local inflammation, as pneumonia, the excess of excreted solids appears after the inflammation has passed off.

As an exception to this general rule about the urine it sometimes happens that patients in the later stages of fever pass large quantities of pale limpid urine of low specific gravity.

Post-mortem appearances.—The post-mortem appearances in fevers are tolerably uniform and are the results of the high temperature; the internal parts are sometimes hot for several hours after death. The arteries and valves of the heart are usually blood-stained, the heart itself is softer than in other cases, and is often slightly dilated. The auricles are full of blood, the ventricles are empty and contracted. The liver is somewhat enlarged and soft; both it and the lungs are usually gorged with blood. The spleen is enlarged in a degree which varies with the intensity of the fever. The neighbouring parts of the intestinal canal are also congested. The kidneys are somewhat enlarged and their cortical substance presents a clouded appearance on section. The anatomical appearances peculiar to typhoid and other fevers will be described with those diseases.

Prognosis.—It varies with the intensity and character of the fever and with the health of the patient.

Intensity.—The higher the temperature, as 105° or 107°, the greater is the danger.

Type or character of fever.—All low continued fevers have a tendency to become adynamic and must be looked upon with anxiety. Complicated cases are more dangerous than the uncomplicated ones.

Previous health of the patient.—In the young and plethoric, and in fat subjects, the fever is more severe and high than in the old and anæmic. The danger is greater if the patient has previously suffered from any specific diseases, as gout, organic disease of the kidneys or of the heart. The danger is always great when there is any history of previous renal disease. The kidneys take a large share in the work of eliminating the results of the waste of tissue, and when these organs are diseased elimination is checked and the morbid materials are retained in the blood.

Treatment of Fever.

Attention to drainage and the state of the soil is essential in all localities where fever is known to exist. In typho-malarial fever or in ague a rapid change from a malarial to a healthy locality is highly beneficial. Certain specific and eruptive fevers almost invariably run a definite course. This must be borne in mind throughout the treatment. In them the progress of the disease should be carefully watched.

The treatment of fever may be dealt with under the heads of *Baths*, *Medicines*, *Alcohol* and *Food*. The main indications are: 1. To diminish the pyrexial state or moderate hyperpyrexia. 2. Attend to the urgent symptoms. 3. Treat the complications. 4. Support the system. 5. Regulate the diet.

(1.) To diminish the pyrexial state. This is best effected by (*a*) external application of cold or by cold or tepid baths, (*b*) the use of antipyretics, (*c*) by remedies which increase the secretion from the skin, bowels, and kidneys, (*d*) drugs which make an impression on the nervous system.

Application of cold.—Cold may be applied in various ways. Its effects upon the surface of the body are marvellous. Under its use the abnormal temperature is lowered several degrees, and degeneration of tissues and other effects of increased temperature, viz. inflammation of important organs, are averted. Cold also reduces the frequency of the pulse, and induces sound and refreshing sleep. The application has further good effects, of aiding in the elimination of the poison from the system, of relieving the nervous symptoms, as headache and delirium, of improving digestion and assimilation, and lessening mortality. In specific fevers, as typhoid or typhus, the poison affects the brain and heart, mainly by causing great elevation of temperature; application of cold acts as an anti-pyretic, lowers the temperature and thus relieves the symptoms referable to these organs.

Various ways in which cold is applied. These are: 1, cold baths; 2, sponging; 3, affusion; 4, packing; and 5, use of ice.

Cold baths.—These are most useful in typhoid fever; where the cold bath appears too severe, a warm bath gradually reduced to the temperature of 70° is used. Putting the patient in a tub of warm water and at the same time pouring cold water over his head is another method. The natives of India owing to the practice of bathing in hot or warm water, suffer much from cold or shivering if immersed in cold water; the dread of its effects prevents them from using a cold bath when recommended in fever. With them the bath should be commenced at a temperature of 95° or 100°, and then gradually cooled down by the removal of warm and addition of cold water, till the temperature of the bath is reduced to 70°. The method of giving cold baths is as follows: The patient is stripped naked; if very weak he is put into a sheet as in a cradle, the assistants remove him from his bed and slowly immerse him in a tub of water of the temperature of 80° to prevent sudden shock. After immersion for a few minutes the temperature is lowered to 70° by the addition of cold water or pieces of ice. The sudden immersion into ice-cold water, when the temperature of the body is perhaps 105°, is likely to cause severe shock; and cases are known where the patients so treated have not revived from the depressing effects. The sudden immersion into a cold ice-bath has led to severe chest complications and to embarrassed breathing, with stupor or coma, seldom ending in recovery. The cold bath is essential in cases where the temperature has gone up to 104° or 105°, and remains at that height for three or four days. The cold bath should be given for from ten to twenty minutes, or so long as the patients do not feel chilly. The patient should be removed from the bath when his temperature goes below 100° or as low as 98°. During immersion the temperature in the rectum or in the mouth should be noted. After the bath the patient is removed to bed and wrapped unwiped in a blanket, and a little brandy and egg should then be administered. By the application of cold in this way the temperature will be gradually reduced to 100° or 101° and will remain low for several hours. In many cases the temperature rises again in a very short time, and then the bath must be repeated or the application of cold wet cloths to the body will be found serviceable.

Sponging.—The surface of the body is sponged with cold or tepid water. This is done in mild cases of continued and remittent fever. The naked body is exposed to the air and sponged for half an hour or an hour. This is most successful where the temperature remains between 101° and 102°. It should be repeated from time to time; under its use the temperature is reduced only one or two degrees, and very shortly after sponging it rises again. It is not so generally useful as the bath, owing to the fact that it abstracts but little heat. Where sponging does good the result is the production of sound and refreshing sleep.

Affusion or cold douche.—The patient is placed in a bath the temperature of which should not exceed 100°, and should be gradually lowered to 60° Fahr., and cold water of the temperature of 60° should be poured over his head and shoulders.

Wet-sheet packing.—This method is applicable in fever cases where the temperature remains between 102° and 103°. It is by far the best method of using the remedy. It consists in wrapping the body with sheets saturated with cold water and then covering it with blankets, at the same time applying an ice-bag to the head. The sheets after a time become warm and should be then re-saturated with cold or ice-water from time to time. The operation may be continued for an hour or two or more. After the sheets are removed the patient should be covered with blankets. In favorable cases the patient perspires as if in a vapour bath; the cold has also the good effect of tranquilising the patient, of reducing the temperature, and procuring sleep.

It should be very cautiously used if the patient is suffering from lung-mischief. The injection of ice-water into the rectum is a useful remedy in such cases. In private practice and among the poor and middle classes in India, the application of cold to different parts of the body, by means of cloths dipped in ice-water and wrung dry, is of equal benefit. If effectually carried out it promptly reduces the temperature, but care must be taken that the cloth as soon as it becomes hot and dry is removed and redipped in ice-water, and reapplied as before.

All these methods should be repeated from time to time; the repetition may be regulated by the subsequent range of temperature. Where the thermometer rises again to 103° or 102°, the process must be repeated. In cases where the progress is slow and the temperature does not remain under 100°, several repetitions and their continuance for several days will be required. In most cases five or six applications are required for the first few days, very often after a few applications of cold in one way, say by baths, the method of wet packing or sponging may be substituted. The applications should in favorable cases be gradually reduced till one or two repetitions may be allowed every day. Where after this treatment the temperature does not rise above 100°, cold bathing may be dispensed with altogether.

In patients lying comatose, constant application of ice to the head, or cold affusion of ice-water from a height over the head, will greatly tend to restore consciousness. In some cases this treatment by ice locally applied may be required to be incessantly tried till consciousness returns.

Effects of the bath.—1. Reduction of temperature. In severe cases it reduces the temperature about 1° or 2° only. In others the reduction is well marked. In cases where the morning remission is slight, the fall of temperature under the bath is least evident. In severe cases the temperature rises again after the bath in one or two hours. Where the rise is slow the recovery is more rapid than where it takes place in a very short time. 2. Relief of the nervous symptoms. Restlessness, delirium, headache, and even coma, pass off, and the mind becomes quite clear. 3. Strengthens the heart's action. Pulse falls in frequency and becomes stronger. 4. Limits wasting. The metamorphosis of tissues and inflammation of internal viscera are lessened or subdued. Thus, if pneumonia or bronchitis coexist with fever, these complications often disappear if baths be administered. That under this treatment the tissue changes are considerably lessened is proved by diminution of the solid constituents of the urine.

Warm bath.—Under its use the waste of tissues by oxidation is greatly diminished. For fever patients the water should not be too hot, nor should the bath be indulged in too long. It is highly refreshing at first, but if continued too long it leads to a sense of oppression accompanied by great prostration. General warm baths produce perspiration, and thus aid in removing from the blood the poison of fever. They are chiefly useful in simple or in inflammatory fevers. In children the warm bath is very refreshing, it soothes their nerves and procures sleep. In adult fever cases, similar good effects are manifested after the bath. The same treatment is equally efficacious in curing restlessness during convalescence from fever. Where warm baths are obtained with difficulty, sponging with hot water may be substituted.

Antipyretic drugs.—To diminish the temperature in fevers, medicines such as aconite, digitalis, arnica, veratria, and antimony are employed with good effect. Aconite has an unmistakable action in lessening the frequency of the pulse and lowering the temperature in the early stages of the fever. The B. P. tincture may be given in ♏v doses every three hours. In most fevers, where the temperature remains persistently high and the skin pungently hot, small and repeated doses are highly useful. It should not be used in cases of fever complicated with mischief in the lungs. It depresses the action of the heart, but increases the flow of blood to the skin, thus rendering the cutaneous function more active and producing perspiration. It is thus by greater radiation and evaporation that the heat is lost and the temperature falls.

Digitalis.—It is given in large doses in fever. It reduces the temperature 2° or 3° and lessens the frequency of the pulse sometimes by 30 or 40 beats in a minute. Under its use the fever heat is reduced and the nervous system very much quieted.

Tartar emetic.—Tartar emetic wine is commonly given as a diaphoretic in fevers. Under its use the skin begins to perspire, the pulse becomes slow, restlessness subsides, and the urine contains increased quantity of urea. It is generally given in the commencement of fevers, soon after the occurrence of the rigor, in one-sixtieth of a grain dose every hour. It has been asserted that in ague, an emetic given every morning will help the action of quinine where quinine alone may not succeed in checking fever. In fevers, when there is much excitement with violent delirium and wakefulness, tartar emetic in $\frac{1}{6}$th or $\frac{1}{8}$th of a grain, combined with Liq. Opii Sedativ. will calm the excitement and induce refreshing sleep. In furious delirium a large dose of tartar emetic with a very small quantity of opium will suffice, while in extreme wakefulness with slight delirium, larger doses of opium will be necessary combined with $\frac{1}{16}$th or $\frac{1}{24}$th of a grain of tartar emetic.

Acetate of ammonia.—Solution of acetate of ammonia is a useful diaphoretic, and is largely used in fevers, especially in the milder forms.

Alkalies.—Some of the alkalies, in the form of citrates or acetates, are considered to be efficacious in fevers. They are supposed to promote oxidation and thus to reduce effete products to urea, in which form they are eliminated by the kidneys. The citrates pass out in the urine as carbonates ; they increase the water of the urine.

Conium or hemlock.—This drug is given in fevers with a view to diminish the frequency of the pulse.

Salicine, salicylic acid, and salicylates are recommended in fevers to lower the temperature. They are said to produce many of the effects of quinia. Salicine may be given in ʒj doses every night or in divided doses of twenty to thirty grains every four hours. As an antipyretic it is highly valuable. The reduction of temperature is from 3° to 7°. Salicylic acid is to be preferred to salicine, as with the former the reduction of temperature is quicker and more lasting.

Quinia.—The alkaloid obtained from cinchona bark is highly useful in ague. In mild cases several small doses given repeatedly are sufficient to arrest the fever. In severe forms, one large dose of thirty or forty grains, to be followed by two or three small doses of six or eight grains every four hours, often summarily arrests the disease. Quinia is useful also as a preventive of ague. It is often administered with this object, and generally with good results, to soldiers and others stationed in malarious districts. It should be given in the early morning, in doses of five grains. A similar dose may also be given at night. Quinia has also been used in the treatment of typhoid fever, but the views as to its utility are somewhat conflicting. It is recommended that one large dose (20 to 40 grains) should be given at night so as to increase the morning fall. The effects are more marked if cold baths are associated with the quinia.

Veratrum.—Tincture of veratria is allied in its effects in fevers to aconite or digitalis. It should be given combined with quinine. Under its use the skin perspires and the temperature falls, and the pulse is lessened in frequency.

Eliminants.—Bowels should be freely moved at first, and the action of the skin and kidneys promoted. Diaphoretics such as Liquor Ammoniæ Acetatis with nitrate of potash and nitric ether, diuretics, and free use of diluents ; and if the urine is very scanty and high coloured, hot linseed poultices to the pubes, dry cupping and mustard to the loins, may be prescribed to promote free action of the skin and kidneys. All the eliminants act by removing the poison from the blood and also by expelling the products of destructive waste of tissues.

Drugs which make an impression on the nervous system.—Where the nervous depression is extreme, as indicated by dry tongue, delirium, and sleeplessness, narcotics, by inducing sleep, soothe the nervous system and indirectly moisten the tongue. Opium is far more serviceable than any other narcotic. Under its use the skin becomes soft and perspiring, the temperature is lowered, and albumen (if any) disappears from the urine. The respirations become less frequent and the nervous system is calmed and soothed. Opium is contraindicated in cases where, under its use, the tongue becomes coated or more dry, the skin more hot, urine more scanty and more albuminous, the respirations more hurried, and the eyes blood-shot owing to severe congestion of the brain. Opium is useful for procuring sleep and checking vomiting and purging, which often occur in fevers. It is also useful for shortening the duration of the paroxysm of ague, and it promotes the tolerance of quinine. Opium is contraindicated if the lungs are involved, if the kidneys are affected, if there be tendency to stupor or coma, or if the pupils are much contracted. In such cases various other sedative remedies as camphor, bromide of potassium, bromide of ammonium, hyoscyamus, belladonna, and even chloroform may be substituted for opium.

Another useful medicine for calming excitement and procuring sleep is the hydrate of chloral. It may be given in twenty-grain doses, either alone or combined with bromide of potassium. Another useful combination is solution of morphia ♏xx, or bromide of potassium ʒss, with tincture of hyoscyamus ʒj. The Liquor Opii Sedativus, in ten to twenty-minim doses is preferable if the patient be very restless and the nervous system much exhausted, as indicated by dry tongue and delirium. The hypodermic injection of morphia is also especially suitable for these cases.

Alcoholic stimulants.—Some caution is necessary in using stimulants in the treatment of fever. Their two chief uses are: 1. To sustain the exhausted nervous system. 2. To assist digestion. In low fevers if the powers of the system fail give alcohol repeatedly in small doses and sufficiently diluted. Milk or soup may be used for dilution. In certain cases very large doses can be tolerated without producing intoxication. Its good effects are known by its regulating the action of the heart. As soon as the first sound begins to lose its distinctness stimulants are indicated. Brandy with the liquid extract of cinchona is very useful in the later stages of fevers. If the impulse and sounds of the heart are weak and the pulse compressible and quick, alcohol may be given with advantage. Alcohol is doing good if (1) the tongue, which was dry and parched becomes moist; (2) the pulse lessens in frequency; (3) the respirations, which were hurried, become tranquil, and (4) the hot and dry skin becomes soft and moist; (5) if it produces sleep and quells delirium.

Young children and old persons suffering from fever become easily and readily prostrated. In them it is of great importance to employ alcohol very early and even in large quantities. It checks fever and diminishes waste; the nitrogenous tissues, which chiefly degenerate in fever, are thus saved from destruction. As a rule the natives of India require more alcohol in febrile diseases than the residents of cold climates. Of the alcoholic stimulants brandy or whisky may be employed. They should be given diluted, and with easily digestible and liquid food, in small quantities and repeatedly, in order that the heart's action may be uniformly supported. In giving stimulants to adults it is desirable to consult their wish with reference to any particular form.

Belladonna.—It is often useful for the relief of headache, which generally complicates fever. Belladonna is also said to control delirium of fevers. In typhus fever it reduces the temperature, lowers the frequency of the pulse, and moistens the tongue.

Camphor.—In adynamic fever with delirium camphor is a valuable remedy. It checks low muttering delirium, strengthens the force and reduces the frequency of the heart's action, and induces perspiration.

Arsenic.—Next to quinine arsenic is the most valuable remedy we possess for the treatment of malarious fevers. From five to ten minims of the Liquor Arsenicalis may be given during the interval. It may be combined with quinine. Some authorities believe that arsenic has a more decided effect than quinine in preventing relapses. It should be given for this latter purpose in the above doses three times a day after meals. If redness of the eyes or other constitutional symptoms be produced, its administration must be discontinued.

The second main indication is to attend to the urgent symptoms. When the tongue is thickly coated the coating may be removed by rubbing the dorsum with a thin, soft cloth or sponge, moistened with honey and white wine vinegar, or a scraper may be used. By so doing we remove the impediment to the sense of taste and thus improve the relish for food; the patient also feels great comfort. *Thirst* may be relieved by cooling drinks, as barley-water, tamarind-water, toast-water, honey and water, lime-juice and ice. Very often chlorate of potash, given with diluted nitro-muriatic acid in some bitter infusion, as gentian, quassia, or cascarilla, checks thirst much more effectually than simple water. The good effects of acids are due to their action in increasing the alkaline secretions, thus the saliva is much increased under their use.

Constipated bowels.—Castor oil is a speedy, certain, and mild purgative, and acts with very little griping. Sulphate of magnesia and phosphate of soda are reputed to be febrifuge and are used as intestinal evacuants in fever. By unloading the bowels they lessen the preternatural heat. Purgatives should be administered with great caution in any case in which typhoid fever is suspected.

Vomiting, if due to some irritating substances in the stomach, as half-digested or undigested food, will be relieved by an emetic of ipecacuanha. When so intense as to depress the vital powers cooling drinks, as iced milk or iced lemonade, should be given in spoonful doses every quarter of an hour. Locally, sinapisms may be applied to the pit of the stomach. In rare cases, where all attempts to check vomiting fail, strychnia in minim doses of the B. P. solution is beneficial. Small and oft-repeated doses of one drop of ipecacuanha wine sometimes have a wonderful effect in checking nausea and vomiting.

Tympanitis may be relieved by a turpentine stupe to the abdomen and a turpentine enema. Opium is also of great value in the relief of tympanitis.

Hiccough is sometimes very distressing, but may often be relieved by sulphuric ether internally, or by half-minim doses of tincture of aconite, or by inhalation of nitrite of amyl. It may also be checked by sipping cold water.

Head symptoms.—*Headache*, if severe and constant, is relieved by large bran poultices or by constant application of eau de Cologne with ice, or by painting the forehead with a paste of powdered ginger mixed with boiling water. Often tight compresses to the temples succeed in relieving it. Where vomiting occurs, headache is sometimes relieved at once. If with the headache the eyes are suffused, showing congestion of the brain, a few leeches to each temple will do good. Very often cold or warm affusion to the head proves serviceable in relieving headache, or the head may be shaved and ice constantly applied. Where there are marked signs of congestion of the brain, dry cupping over the nape of the neck, and even small blisters to the temples or to the neck, may be tried.

Sleeplessness.—Sleep may be procured by giving Dover's powder, hydrate of chloral, or bromide of potassium with hyoscyamus. When there is throbbing of the temples with violent headache and active delirium, hydrate of chloral, or small doses of antimony, or of ipecacuanha with opium or Dover's powder, may be given. Belladonna is very often useful, but if the delirium be low and muttering, stimulants with opium are more likely to prove efficacious.

In all cases of coma with delirium, flying blisters or mustard poultices to the neck are useful aids. Stupor or coma can also be relieved by free douching to the head. In these cases the state of the bladder should be carefully watched. If there is retention of urine a catheter should be introduced three times every twenty-four hours. The bowels should be relieved by enemata of castor oil and turpentine, and bedsores be looked for and if possible prevented. These sores are very troublesome to treat, and may be even dangerous, owing to the failure of the patient's strength. When they threaten to form, collodion or white of egg beaten up with brandy should be used as a paint over the affected parts, and the pressure of bed-clothes relieved by cotton-wool. In patients with tendency to bedsore blisters are dangerous.

In the weak and debilitated prostration may be prevented by the use of musk or alcohol, and also by an enema of castor oil with turpentine and assafœtida.

Adynamic symptoms, as collapse, require stimulants, combined with ammonia, bark, ether, chloroform, musk, or camphor. Complications must be treated as they arise. Should congestion of the lungs or pneumonia supervene, local applications, such as turpentine stupes to the affected region, or linseed poultices, or spongiopiline wrung out of hot water, oftentimes check the lung complication. Similar treatment is also useful if there be signs of congestion of the liver.

Diet is all essential. It should be liquid and easily digestible. Farinaceous articles of food and milk are more suitable than eggs and soups—the latter often set up diarrhœa. Milk alone or mixed with lime-water may be given with benefit. Fresh fruits, as grapes and oranges, and even pomegranates and figs, may be given.

Ventilation, cleanliness, rest of body and mind, are most important requisites in fever. A competent nurse is necessary, but the presence of many relations and friends near the patient should be strictly forbidden.

CHICKEN-POX. VARICELLA.

Chicken-pox is a moderately contagious eruptive disease, the contagium existing in the breath, perspiration, and crusts which follow the eruption. It is characterised by numerous vesicles upon red elevations, which shrivel up on the third or fourth day, desiccate, and fall off in from five to eight days after the eruption, and leave no scars. The initial symptoms last for a day or two, and are followed immediately by the eruption. The duration of the complaint is from six to seven days. It usually prevails as an epidemic. It sometimes precedes, accompanies, or follows smallpox epidemics, and very often coexists with scarlet fever or measles. It sometimes occurs sporadically, and it attacks but once in life the same person. The attack is characterised by the mildness of the premonitory symptoms, the vesicular character of the spots, the absence of any hard shot-like feel to the fingers, and the short course of the complaint.

Symptoms.—Incubation is of short duration, lasting at most two days. *Prodromal stage.*—Its symptoms are slight vomiting, irritable temper, loss of appetite, and thirst. These set in with slight fever, headache, and pain in the back. Drowsiness and coryza are sometimes noticed. In some cases the eruption is the only symptom of the disease. There may be no prodromal stage, and the child may be quite well till the eruption appears. This spreads over the body without any regularity. It is generally most marked on the breast and back. The face is often free. The eruption is thickest, and appears as small distinct rose-coloured papules, without any inflamed ring around them, in the first stage. On the second day of the eruption, or after a few hours, these become vesicular in their centres, but are not umbilicated nor have a cellular formation as in smallpox. The contents appear whitish, but never purulent. They usually begin to appear within twenty-four hours after the invasion, and last also for twenty-four hours. They appear singly or in groups, and in successive crops, for four or five days. On the third day their contents become milky or cloudy, like whey, and are surrounded by a red areola. On the fourth or fifth day of the fever *desiccation* begins, or thin crusts form from the dried vesicles. Those vesicles which are not broken or scratched by the child to appease itching become shrunken at their margins. The scabs or crusts fall off between the eighth and ninth day, leaving a red spot, but seldom any pit or a cicatrix. Unlike smallpox, during the maturation period of the eruption there is usually no fever, but the temperature may rise to 101° for a short time. Where the eruption is extensive a few vesicles may become converted into pustules, and even leave cicatrices.

Decline.—The slight fever subsides with the eruption in seven days or often less, when convalescence sets in. It is rare to have a single crop of vesicles. Fresh new crops appear for several days. The mucous membrane is never affected with the eruption, as is the case with measles and scarlatina.

Diagnosis.—Chicken-pox may be confounded with smallpox. The mildness of the attack, the earlier appearance of the vesicles, the absence of proper suppuration, and absence of the hard shot-like feel, exclude smallpox. Smallpox is preceded by a fever of a certain duration, not so in chicken-pox.

Prognosis.—Favorable; trouble, if any, arises from catarrh or pneumonia contracted by imprudent exposure.

Treatment.—Attend to diet, and avoid cold. If fever and headache be considerable treat on general principles by giving salines and antimonials with nitre, and by keeping the secretions free by gentle laxatives; rest in bed and warm or tepid baths are essential. The patient should be separated from those who are liable to be attacked by the disease. For general debility give iron and cod-liver oil.

SCARLET FEVER (SCARLATINA).

Scarlet fever is an acute infectious disease. It is highly contagious, and readily carried from one place to another. It is often epidemic, and has been observed in places without its origin being detected. It is probable, however, that it is never developed spontaneously. The fact that persons not in actual contact with the scarlet-fever cases, but only near them, become infected shows that the poison is contained in the exhalations of the patients and mixed with the atmosphere about them. It is also probable that the poison may be conveyed to others by healthy persons who have been in contact with scarlet-fever cases, but without contracting the disease. It is also contained in the desquamated particles of skin. The predisposition is less common than is the case with measles. It is not essentially a disease of childhood, but children above two years are most susceptible to it; adults, however, and even old people are often attacked. As a general rule it occurs only once in a life. The rash appears on the second day, and is followed by desquamation about the sixth or seventh day. Simultaneous inflammation of the mucous membrane of the mouth, pharynx, and tonsils also occurs. Different epidemics vary in intensity. Thus Sydenham, in the reign of Charles II, speaks of scarlet fever as hardly more than the name of a disease.

Characteristic marks.—There is diffuse scarlet or crimson redness (of different shades) of the skin generally and of the mucous membrane of the fauces and tonsils. The period of incubation varies from eight to fourteen days. The eruption begins most often at the root of the neck, but never on the face, and spreads over the whole body within twenty-four hours, and is followed by copious desquamation. The redness appears in numerous bright red points, which soon unite and form a uniform blotch. Sometimes the redness is distributed in irregular vivid red spots, disappearing on pressure, but soon returning when the pressure is removed. They are not much elevated, and without any determinate form. The redness is most marked about the neck, the flexures of the joints, and the back of the hands; there are sometimes absolutely clear spaces. In rare cases the surface is pale red with darker red spots over it. In the malignant form, besides hyperæmia of the skin, there are petechiæ and ecchymoses. In consequence of the great determination of the blood to the papillæ and glands of the skin the surface is often rough. At first the tongue is coated, creamy white in the middle, and vivid red at the tip and edges, becoming afterwards clean and raw-looking.

Simultaneous inflammation of the mucous membrane of the mouth and pharynx and tonsils occurs, and is also due to the poison. The mucous membrane covering these parts is at first dry, dark red, and swollen, subsequently it is covered with secretion of mucus. In malignant cases the exudation is fibrinous, and the diphtheritic inflammation attacks the pharynx, tonsils, &c.

Associated with pharyngitis we find inflammation of the parotid glands, and of the lymphatic glands in the neck. These glands generally suppurate.

Other changes induced by the infection are inflammation of the internal ear, inflammation of the joints, pleura, &c. In all these cases the disturbance is due to deranged nutrition of the entire body, leading to changes in the skin and other parts above described.

Morbid appearances.—These include morbid conditions observed during life, namely, inflammation of the skin and of the mucous membrane of the pharynx. After death we find hyperæmia of the kidneys, and sometimes inflammation of the joints, pleura, pericardium, cornea, and ear. The blood is poor in fibrin, thin, and of a dark colour. There is enlargement of the spleen and of the intestinal lymphatic glands.

Pathology.—The poison is contained in the secretions of the skin and fauces; it is of a material nature, and is carried by the air. The disease is inoculable and prevails in all seasons. In India it is occasionally seen in the months of May, June, and July. The effect of the poison is to produce congestion of the blood-vessels of the skin and the mucous membrane lining the pharynx; to cause hyperæmia of the kidneys, a condition soon followed by a rapid proliferation and desquamation of their epithelium, just as it takes place on the skin.

Varieties.—1, simple; 2, anginose and 3, malignant.

Simple or benign scarlet fever is the most common and is characterised by a scarlet rash; by slight inflammation, but without ulceration of the fauces; by moderate fever. The power of infection continues from the commencement of the disease till the end of desquamation.

Symptoms.—First stage or incubation. This stage is shorter than in measles, and varies from twenty-four hours to a week or ten days.

Invasion.—It may be sudden; in children it is very often preceded by convulsions, and in adults by weariness and depression, or by nausea and vomiting. According to individual peculiarities, the prodromal stage begins with repeated rigors or chilliness, followed by burning heat of the body, and other symptoms of fever, or by drowsiness, great thirst, loss of appetite, constipation of bowels, and sore throat. There is also frontal headache, frequent pulse, 120 or 130, and high temperature, even 104° or 105°, on the first or second day. The temperature and pulse are eminently characteristic of an acute infectious disease, and, combined with soreness of the throat, are especially suggestive of scarlatina. Pharyngitis does not occur at the commencement of measles, smallpox, or other infectious diseases. In scarlatina there is a feeling of dryness, heat, and pain in the throat, and difficult deglutition. The mucous membrane is swollen and dark coloured. Some patients lie in an apathetic state, other are restless and often slightly delirious. The tongue is very characteristic; the papillæ project as red points through the white mucus on the surface, afterwards the whole tongue becomes very red. This stage lasts for a few hours or for one or two days. In some cases the eruption appears at the same time with the fever, but the second day is the ordinary time of appearance. The fever does not abate with the development of the eruption; on the contrary, it becomes more severe. The headache, apathy, or excitement increase. Convulsions are apt to occur in children.

Eruption.—Bright red points are first noticed. They appear first on the neck, then on the breast, arms, abdomen, and lastly on the lower extremities. They quickly become confluent in patches of greater or less extent, and the redness becomes more or less general over the whole body. It is distributed in irregular, vivid red blotches, disappearing under pressure, but soon returning when the pressure is removed; it is but little elevated and is without any determinate form; the redness is most marked on the neck and about the flexures of the joints, as in the groins, armpits, and bend of the knees and elbows. There is a feeling of burning heat, irritation, or itching in the skin. If a nail is drawn over the skin where the eruption exists, a central red line, with white streaks on either side, is produced. The exhalation from the skin smells like mouldy cheese or caged beasts. With the eruption the fauces become more red, the tonsils are congested, swollen, and tender when touched behind the angle of the lower jaw, the uvula is also œdematous, the submaxillary glands are tumid. The tongue is also characteristic. Before the eruption, it is coated with a thick white or yellowish-white fur, but in two or three days, or during the eruption, it becomes of a deep red colour all over, and the papillæ project, giving a rough appearance to the surface. The redness of the skin reaches its maximum about the third or fourth day. The fever is at its height on the second day, when the pulse is 120, 140, or 160 in a minute; the skin is pungently hot and dry; the respiration is more rapid. The temperature rises when the eruption is fully developed, it often reaches 106°, and then subsides slowly. The peculiarity about the temperature is that it rises rapidly till the day of the eruption; after the eruption has reached its maximum it gradually falls, and it reaches the normal about the twelfth day. It is highest on the third day of the fever or on the second day of the eruption; the higher the temperature the more serious is the case. There may be vomiting; the abdomen is somewhat tender and the liver and spleen are enlarged. The urine is scanty, of high specific gravity, the urea is not necessarily increased, chlorides diminished, phosphoric acid normal for first three days, then diminishes to half or one-third. Albumen is present in almost every case, associated with large quantities of epithelium.

Decline.—This stage commences about the sixth, ninth, or tenth day of the fever, and lasts for about a week or ten days. The pulse loses its frequency, the skin is less hot, there is less swelling of the tonsils and pharynx, deglutition is more easy, and the appetite improves, the eruption gradually disappears. Usually desquamation first begins on the neck and then in the neighbourhood of the joints; from the palms of the hands detached scales are often peeled off by the patient. Desquamation lasts from a few days to a week or more, and recovery follows. In cases of a more severe type the throat becomes ulcerated and sloughs, and there is tendency to dropsy, which ought to be looked for, and sometimes uræmia supervenes. These variations are due to the asthenic character of the fever, partly to great increase of bodily heat and partly to the variety and extent of local lesions.

(2) *The anginose form* is a more severe type; in this variety the symptoms which occur in the throat are much more violent. The throat is red and ulcerated, and pseudo-membranous exudation forms on it. There is a tendency to the formation of abscesses in the neck.

Symptoms.—Incubation. Is of very short duration.

Invasion.—Sets in with violent fever, headache, restlessness, and extreme prostration; there is great tendency to delirium or stupor. The pupils are dilated, the skin is pungently hot, the temperature very high, and there is severe nausea, vomiting, and often diarrhœa. Very often convulsions occur in children. In unfavorable cases patients die before the eruption or local pharyngeal, or other symptoms of scarlatina appear. Death may be due to collapse or pulmonary œdema. In other cases on the second day of the fever, the pain in the throat, stiffness of the neck, hoarseness of voice, and painful deglutition are prominent symptoms. The fauces, tonsils, uvula, and palate appear red, swollen, and covered by patches of exudation. The parotid and submaxillary glands are also swollen. There is one universal redness over the face and limbs, which are also somewhat swollen. The eyes and nostrils are more or less red, and there is an acrid discharge from the nose. The eruption is often slow in appearing and irregular in its distribution. It appears first in scattered patches on the chest and arms, and then spreads and vanishes in two or three days.

Decline.—Fever and inflammation of the throat abate, though painful deglutition lasts for a week or ten days. Inflammation of the serous and mucous membranes is very common.

(3.) *Malignant form.*—The scarlet rash is scarcely if at all visible. There is extreme prostration and depression, low muttering delirium, and stupor, with vomiting and cold extremities. The local manifestations assume a dangerous character; thus in the first stage the swallowing becomes extremely difficult; the tonsils severely inflamed. The inflammation of the fauces assumes a diphtheritic form, and the nasal discharge or coryza sets in. This last symptom is absent in the simple or favorable form. There is a fetid odour from the nose and mouth. The fauces and pharynx are found to be dark red or dirty white, and here and there present a sloughy condition. The glands in the neck are also swollen and form a hard lump. As the case advances, there is great irritability and restlessness, the pulse becomes extremely feeble, very frequent and irregular, and barely perceptible. The temperature is about 104° or 105°, the respirations are oppressed; there is generally diarrhœa; the tongue is dry and brown and chapped, the breath is fetid, and there are sordes about the teeth. The urine contains albumen from the first. The patient dies from adynamia or from paralysis of the heart. The eruption often comes very late, and disappears in a few hours, being of a dull hue, changing into a livid red, often like black spots under the skin. The disease terminates fatally on the third or fourtn day. In some cases there is suppression of urine, and death from uræmic convulsions results. Death from fibrinous coagula in the heart, or from hæmorrhage as the sloughs detach, is also common. Continued coma, oppressed respirations, copious diarrhœa, prognosticate speedy death. In favorable cases desquamation takes place, ulcers in the neck heal, and the fetid nasal discharge ceases.

Complications of scarlet fever—Croupous or desquamative nephritis —The most important complication of scarlet fever occurs in a large proportion of cases in the desquamative stage, and is associated with dropsy. The disease is not, as is commonly supposed, necessarily due to cold, but it depends upon the localisation of the blood-poison. It sometimes begins without any warning. Sometimes it is announced by a slight rigor. Once commenced it does not differ in its symptoms, its prognosis, or its pathological results, from the acute nephritis which occurs without preceding scarlet fever, and which is described under Diseases of the Kidney. Rheumatic symptoms occur towards the end of many cases of scarlet fever, with all the usual complications of rheumatism, *pericarditis* being in these examples perhaps the most frequent. Pneumonia and pleurisy may also occur. Dropsy is a frequent sequel of scarlet fever, even after the mildest cases and the lapse of some weeks. Albuminuria generally coexists, but is sometimes wanting. The acute croupous nephritis sometimes, though rarely, terminates in chronic Bright's disease. These affections do not differ in any way from those described in the chapter on the kidney, but it is worth remarking that kidney-disease originating in scarlet fever is a common cause of convulsions and death in the first confinement of young women. The affection of the throat sometimes extends through the Eustachian tube to the tympanum, and leads to inflammation and abscess of the internal ear, and to perforation of the drum or to caries of the petrous portion. The consequences are grave; permanent deafness results, or the abscess in the ear may serve as a starting-point of infection, and the patient may die of meningitis or of pyæmia. As the abscess may show no external symptoms, the causes of death in these cases is often very obscure till cleared up by post-mortem examination. An attack of scarlet fever may give rise to the first appearance of the symptoms of scrofula. The inflammation of the lymphatic glands in the neck rarely ends in resolution. They generally suppurate. In cases where the disease is merged into diphtheria paralytic symptoms have been known to occur. It may be remarked that during epidemics of scarlet fever, persons who have had the disease and are in the neighbourhood of the sick often suffer from sore throat. There may be an ulcer on one of the tonsils, but rarely a false membrane.

Treatment for scarlatina simplex.—Avoid exposure to cold, keep the patient and the attendants isolated from others in order to prevent the spread of the disease. The patient should be kept in a well-ventilated room of a uniform temperature of 60° to 65° F. and in perfect repose. He should be washed every day, and should be fed with liquid non-stimulating diet, consisting of milk, weak broth, and soup; iced lemonade may be given as common drink. Interference medicinally or otherwise is unnecessary and useless. The disease must run a regular course. Belladonna has been tried as a protective against scarlatina, but without good results. The danger of infection by the scales of skin flying about in the air during desquamation, should be guarded against by rubbing the patient night and morning with vaseline or carbolic oil. Exposure to cold should be avoided, and it is necessary to keep the patient in bed for several days after desquamation is complete. He should have a daily bath in luke-warm water. In severe cases, where there is great heat of skin, veratrum is beneficial, it lowers the pulse and lessens the temperature. If the tongue be coated and there be great irritability of the stomach, give ipecacuanha; constipation may be obviated by laxatives or by enema. The diet for the first five or six days should be liquid. For high temperature without any local complication use cold baths or the wet sheets. These often have a very surprising effect. For pain in the throat and for exudations over the tonsils use vapour of steam or hot milk, and local applications of linseed poultices and anodyne gargles with chlorate of potash. A cold wet compress to the throat may also be recommended. Dialysed iron internally may be freely used in these cases. For high degree of delirium, or where the head is much affected, immersing the feet and legs in warm water and mustard is attended with a good effect. For *scarlatina anginosa and maligna* the stimulant plan of treatment is indicated. Camphor and sesquicarbonate of ammonia are the most suitable medicinal remedies. These stimulants tend to prevent impending paralysis. For very high temperature cold affusions, cold baths, and cold sheet packings may be recommended. If sloughs form in the pharynx they must be locally treated. The discharge from the nose requires injections of weak solutions of nitrate of silver. Diarrhœa, or vomiting, or other complications, must be treated as they arise. For dropsy give drastic purgatives, with antimony and digitalis, and diuretics if the urine be scanty, and apply cupping or hot bags of sand to the loins. Juniper is highly recommended. Warm baths may be advantageously employed. Mustard baths are useful if there be recession of the eruption.

Dengue Fever, Dandy Fever, Break-Bone Fever.

Dengue fever, otherwise called rheumatic scarlet fever or kidinga papo, is a peculiar form of continued fever characterised by frontal headache, severe pains in the limbs and trunk, and sometimes by an eruption resembling that of measles over the body. It is epidemic and infectious, and one attack is protective as a rule. It is popularly known as dandy fever or break-bone fever. Some years ago it attacked the natives of India, and it was then called leg-fever from one of its most prominent symptoms, viz. severe pain in the lower extremities. The name *kidinga papo* is derived from the Arabs, with whom the words mean "cramp-like pains caused by evil spirits." As an epidemic it has been very limited in its range. It seems to spread through contagion. Spain is the only country in Europe in which it has been noticed. Even in India it is limited to certain localities, as Bombay, Cutch, and Calcutta. In Calcutta an epidemic occurred in 1871. In Bombay it broke out with great severity in 1875. There have been numerous outbreaks of the disease in the West Indian Islands, and in the Southern States of America. The disease as seen in India spreads rapidly among all classes of the community both Europeans and natives. The rich and the poor suffer alike, the feeble and robust, the young and old, all are attacked. The susceptibility varies, sometimes only one member of a family escapes. In a few cases only one member of a family is attacked, while all the others escape. The complaint varies in its symptoms according to the locality. The period of incubation also varies. In some persons it is very rapid, in others it is prolonged. The seizure in a majority of cases is sudden. No two people suffer alike; some patients complain of excruciating pain and stiffness of the muscles of the palms of the hands and the soles of the feet. The pain is increased on movement; it is followed by swelling and redness at a particular spot without any premonitory symptoms. In some cases there is stiffness of the body just before daybreak or on leaving the bed. This is soon followed by fever. The skin is hot and dry, the temperature is very high at first, rising to 105° on the first day. It seldom remains high, but rises and falls during twenty-four hours. The pulse is frequent, and in children it even rises to 140 beats in a minute. Its frequency diminishes with the fall of temperature. The face is of a bright scarlet colour and is also somewhat œdematous. In some cases there is from the first, pain in the back and shoulders and in the ankle-joints and wrists. On the second day of the attack the pain is followed by swellings of the small joints, which are also painful on pressure.

The appetite is deranged; there is anorexia; even the sight of food produces nausea. The taste is bitter, and there is often vomiting of bile. The tongue is coated white with a cream-like fur, and is red at the tip and edges. The urine is scanty and red, or abundant and pale. The sp. gr. is high and the reaction is acid; in many cases it is albuminous. The patient is often drowsy, but the sleep is unrefreshing.

There is often obstinate constipation. In some cases the fever lasts only for forty-eight hours and then subsides. In a vast majority of cases there are remissions. In many cases the rash appears within a few hours after seizure. It is most distinct on the palms of the hands and upper part of the chest; it soon fades on pressure. The eruption resembles erysipelas, only the discoloration is less intense than in that disease. It spreads over the whole body in from thirty-six to forty-eight hours. It first appears on the face and neck and then spreads downwards. In severe cases the neighbouring lymphatics, *e.g.* in the neck, axilla, and groins, become swollen. The mucous membrane of the mouth and throat also becomes red and tender, and aphthæ appear with great tumefaction of the nose, eyes, and lips, and congestion of the conjunctivæ. In a large majority of cases the febrile phenomena return on the fourth day, and with the fever the eruptions. The terminal rash resembles measles and is often limited to the neck and chest. It appears and disappears suddenly, and like urticaria it is attended with itching. In many cases the rash takes the form of large bullæ or vesicles. The complaint lasts for eight or ten days, but relapses are frequent.

Complications.—Great prostration and debility. The acute stage generally terminates by the end of the first week, when the skin begins to desquamate, although the pains in the limbs may continue for a long time. Other complications are: malarious fever, occasionally sunstroke, and disease of the spleen.

Sequelæ.—Desquamation of the skin from the tips of the fingers and toes. The disease often leaves stiffness and pain of joints for many months. Diarrhœa often follows an attack of dengue. Painful gums and scurvy also follow it. The swelling of the lymphatics and submaxillary glands and of the tonsils, and also boils and carbuncles, often cause great annoyance.

Treatment.—The disease is of a very depressing and debilitating nature; the patient should remain in bed and have nutritious diet. Emetics should be given only if the tongue be much coated and there be much gastric derangement. No stimulant should be given. Anodynes may be prescribed both locally and internally as a relief to pain. In children the bowels should be kept freely open and bromide of potassium administered to ward off convulsive attacks. The latter remedy allays the excitement of the nervous system, the vomiting, and pain in the epigastrium. The treatment for the febrile phenomena is the same as in cases of malarious fevers. For the pain of dengue belladonna appears to be the most satisfactory remedy. To adults ten minims of the tincture are given every hour up to three doses. Relief is generally obtained, and the medicine may then be given at longer intervals. When the pains are very intense and distressing, a full dose ($\frac{1}{48}$th of a grain) of atropia may be injected subcutaneously. During remission give iodide of potassium in large doses, and continue it a few days after desquamation. In all cases the patient should be guided through the attack and every urgent symptom watched and treated. Tonics and good nutritious diet are generally indicated during convalescence.

Small-pox or Variola.

Small-pox is an exceedingly contagious eruptive fever. The contagium is capable of being carried long distances. The virus is known by its effects, and exists in the pustules, and in the exhalations from the skin and lungs. It is most powerful at the period when the vesicles begin to change and form pustules, or when their clear contents begin to turn cloudy. The disease is characterised by an initial fever, which lasts for three or four days, and is followed by a cutaneous eruption, which is at first papular, then vesicular, and lastly pustular. The eruption attains maturity in from six to nine days, after which the pustules are converted by desiccation into scabs which fall off between the fifteenth and the twenty-fifth days. These often leave a pit or scar. The disease affects persons of all ages, but the young are more liable to it than those of advanced age. It affects mainly the poor and destitute who neglect vaccination, and the rich natives of India, who, from prejudice or ignorance, refuse vaccination for their children.

Small-pox is produced by contagion or infection. The poison may be received through the lungs or skin. It is apparently not contained in the blood or the secretions. Inoculation with these fluids is said to produce no effect. It is apt to become inert if exposed to air. Its vitality under favourable conditions is very great, and it may remain active for years. It is not destroyed by drying, hence it can be preserved in hermetically sealed tubes or on points. It also clings to objects near the small-pox patient. The disease is most prevalent in the spring and summer. At these times, from some unknown cause, the disease is epidemic in certain localities. The intensity and effects of the poison vary. The latter depend upon the individual peculiarity or susceptibility to it. Some get a severe form, others a mild one, while yet a third class escape altogether even though they may be most exposed to its influence. One attack usually protects the patient for the rest of life. The disease is now-a-days usually modified by vaccination. In some persons vaccination exerts a protective influence for life, in others its effects are transient and last only for a few years, hence the practice of revaccinating every seven or ten years becomes necessary. If small-pox attacks vaccinated persons the symptoms are almost always mild, and this circumstance, as well as the shorter duration of the disease, illustrates the salutary effects of vaccination. This contagion is the most powerful of its class. The power of infection continues even after the last scab has fallen off. The disease is capable of being communicated from the mother to the fœtus before birth, similar to what happens in the case of syphilis.

Stages.—These are four in number: 1. Invasion. 2. Eruption. 3. Maturation. 4. Desiccation.

Incubation.—This period lasts from seven to twelve days without any manifestation of ill-health. Prodromal stage or the stage of invasion, otherwise known as primary fever or initial stage, commences with three characteristic symptoms. It commences in children with (1) convulsions, and in adults with severe pain in the loins and bones, or (2) with a chill or several rigors, soon followed by fever and profuse sweats, nausea, persistent vomiting, and loss of appetite; the tongue is red at the tip and edges or coated and slimy; there is often a sense of fulness in the abdomen; sometimes there is epistaxis; (3) or the invasion sets in with intense headache, restlessness, sleeplessness, and delirium. The fever is generally very high; the temperature rises to 104° or 105°; the pulse is full and frequent, 120 or 140 in a minute. In small-pox infection, the symptoms most characteristic are high fever, constitutional disturbance, and severe pain in the loins. In measles and scarlatina the local affections of the conjunctiva and of the mucous membrane of the fauces respectively are prominent symptoms. On the third day the febrile symptoms attain their height as the eruption begins to appear, but they then subside and diminish greatly as the eruption spreads. On the third day of fever changes take place in the skin. There is superficial inflammation, and numerous small papules are produced. In mild cases the *eruption* appears as small, isolated, red specks, which become first papules, then vesicles, and finally pustules. In them suppuration takes place only in the rete Malpighii, but no loss of substance occurs. In severe forms the eruption appears earlier than in mild cases. As a general rule, the force of the eruption bears relation to the severity of the symptoms in the invasion stage. Thus a confluent eruption is generally preceded by very high fever. Sometimes a roseolous or erythematous rash precedes the true eruption. On the second or third day after its appearance, or on the fifth or sixth day of fever, the eruption spreads from the face to the neck and back and extremities. The papules are flattened at the top and contain no fluid. In from twenty-four to forty-eight hours the epidermis is raised by fluid exudation into a vesicle, depressed in the centre or umbilicated; this stage lasts from three to four days. The contents of the vesicles then become pustular. The suppuration in severe cases attacks the tissue of the cutis and destroys it, leaving a cicatrix or pock-mark. The inflammation extends from the skin to the subcutaneous tissue. During the changes which the vesicles undergo, they become surrounded by inflamed areolæ, which often run together, so that spaces between the pocks are of a bright red colour. The areolæ fade gradually into the natural colour of the skin, at a distance of two-thirds of a line from the base of the vesicles. The complete pustules or maturation pocks are not umbilicated, as the vesicles, but are convex on the surface. During maturation the areolæ gradually fade and assume a purple hue. The eruption appears not only on the skin, but also on the conjunctiva and on the mucous membrane of the mouth, nose, pharynx, œsophagus, and sometimes of the urethra and vulva. In these situations they cause many distressing symptoms from the time at which the vesicles appear till the pustules begin to break. They begin at the same time with the skin eruption, but are noticed only later on, as their presence does not cause much annoyance at the commencement. When pustules appear in the mouth and throat there is increased flow of saliva, which constantly trickles down, and the tongue and gums present white points with red membrane between. The pustules often exist in the pharynx, as may be known by the sore throat, the difficulty in swallowing, and the tenderness of the submaxillary glands. If the pustules attack the larynx, the voice becomes hoarse or whispering. There is cough and sometimes spitting of blood. The eruption in the urethra causes scalding and difficult micturition; when on the conjunctivæ lacrymation and photophobia result. There is also œdema of the subcutaneous cellular tissue, causing the skin to be swollen, red, elastic, and shining; this swelling is greatest on the face. The initial fever sometimes continues for a day or two after the eruption, but when papules are formed the fever generally remits, and throughout the whole vesicular period there is no fever till the sixth day after the eruption. The appetite returns, sleep becomes tranquil, and the pulse and temperature nearly normal. The sacral and lumbar pains disappear. The patient feels comparatively well towards the end of the eruptive stage.

About the sixth day of the eruption, or the ninth day of fever, the pustules have formed and are ripening on the face. The same process takes place in those on the extremities, thus the suppurative or *maturation* stage begins, and all the vesicles are converted into pustules. This stage is attended with secondary fever. Towards its termination a disagreeable fetid odour is exhaled. In this stage the pocks are larger. They now lose their central depression, and become convex or hemispherical. After a time the pustules burst, and thick purulent contents escape. The skin round the pocks swells, and is dark red; the face swells; the eyelids are tumid; the patients are disfigured, and complain of tension of the skin which is covered with pustules. The eruptions on the mucous membrane now manifest their distressing symptoms. The saliva flows incessantly from the mouth. The parotids are enlarged and tumid. The swallowing becomes difficult. The voice is hoarse, and there may be cough. The conjunctivæ appear dark red, are covered with mucus, and burning is complained of. Later on pustules appear on the genitals, and there is severe burning during micturition, and severe pain in the external parts. During this stage the fever exacerbates, and is known as secondary or suppurative fever. This fever or maturation stage begins with repeated chills. It is supposed to be due to the inflammation of the skin. In this stage the pulse again rises from 85 to 120, becomes full, hard, and strong; the skin is hot and dry. The temperature rises to 102° or 104°. The more confluent the eruption the greater the severity of the secondary fever. In the suppurative stage, where the fever is very high, death often ensues from adynamia or from paralysis of the heart. Very often in such cases the pocks assume a hæmorrhagic form. With the fever there is delirium, and great disturbance of circulation and nutrition. The affection of the mucous membrane leads to diphtheritic inflammation, which is very dangerous. Pneumonia and pleurisy are apt to set in during the suppurative stage. Suppuration of the joints with intermuscular abscesses sometimes occurs. Other symptoms of pyæmia are occasionally present. The inflammation of the larynx and pharynx may assume a croupous form, and be associated with œdema of the glottis.

Stage of decline or fourth stage.—It is also known as the stage of scabbing or the desiccation stage. After the suppuration has been fully established, *i.e.* on the ninth or eleventh day of the eruption, or after suppuration has lasted for four or five days, the secondary fever disappears. About this time the desiccation is nearly completed on the face, and has just commenced on the limbs. This is known as the stage of decline. During this stage some of the pustules which have remained unbroken break and discharge their contents, and then dry to soft yellow crusts, which subsequently become hard and dark coloured. The other pocks lose their tension, become brown in the middle, dry, and sink in, and the contents dry into a round scab. The crust or scales or scabs begin to form between the sixth and the ninth day of pustules, or on the twelfth or fifteenth day of eruption. The temperature during the decline falls to 99° or 98·4°. The pulse is reduced to 90. Subsequently these scabs fall off; their detachment takes place very irregularly. Some of them fall off in four or five days. This occurs generally where there is no ulceration of the skin. In some cases where ulceration of the skin exists the scabs remain for a long time, and their detachment exposes more or less deep pits or depressions. The depressions left by the scabs are red at first, and then become white. Where ulceration has taken place the marks last for the whole life, but where there has been no ulceration the marks disappear as time goes on. The symptoms due to eruption on the mucous membrane, as salivation, dysphagia, dyspnœa, hoarseness, and ischuria, all cease with the cessation of the maturation stage. Other symptoms also improve. Fever continues with the suppuration stage, but is moderate, and ceases altogether soon after. With the favorable progress the health becomes normal. Those scabs that fall off early leave only red spots, which disappear, leaving no cicatrices. Crusts first appear on the face, and in from two to four days afterwards they extend to the limbs.

In some cases a dark point is formed in the centre, which extends and converts the whole pustule into a hard crust; in others the whole dries at one and the same time; in others, again, the epidermis gives way, and the contained fluid which escapes hardens into a depressed yellowish irregular crust, which then becomes brown before the crust falls off; some pustules, again, as on the arms and legs, do not form crusts, but shrink away, their fluids becoming absorbed, and they leave behind portions of cuticle, which fall off by desquamation. Some of them ultimately leave depressions or pits, which are permanent. As the crust formation progresses the skin around loses its redness and swelling. The tension and pain of the face diminish, and are followed by intense itching. The pain from tension now begins to be felt in the swollen limbs.

Anatomy of a variolous pock.—There is inflammation of the true skin, commencing in a central point and spreading on the surface; it also penetrates to a greater or less depth. The inflammation is accompanied by a red areola, which extends to some distance beyond the margin of the vesicle. When a vesicle is opened soon after its formation it contains a little clear serum, which is limpid and alkaline, the skin beneath is red, soft, and moist. The fluid soon becomes clouded by the formation of pus cells. These with the exudation fluid and swollen cells of the rete Malphighii form a pustule, the umbilicated appearance of which is due to adhesion between the centre of the pock and the surface of the skin beneath. This adhesion is broken at a later period, when the pustule becomes globose. A vesicle is made up of various small partitions, and has a fan-like axis, which is due to the central cells of the epithelium dipping down between the papillæ, so that when a single puncture is made in it, it does not discharge the entire contents. Soon after the conversion of a vesicle into a pustule a cavity is found, which contains a false membrane, which is opaque, white, friable, and is seated on the derm in small white points. These points enlarge, meet, and form the false membranous disc, and the pock is filled with serum and pus. At a later period, in mild cases, the papillæ are compressed and flattened by pressure of the pock, and the pustules dry up. New skin forms under the scabs, and the latter fall off, leaving slight excavations. In severe cases the papillæ become infiltrated with pus and break down. The contents of the pustules are now pus cells mixed with the detritus, the result of breaking down of the papillæ. The umbilicated pustules now become globose. Some of them break and discharge their contents; others dry up and are detached, leaving depressed radiating cicatrices.

Variety of pocks in small-pox.—The variety depends upon the extent and form of the pock. There are two groups, the unmodified and the modified. The groups are further subdivided into (*a*) distinct, (*b*) confluent, (*c*) semi-confluent, (*d*) abortive, (*e*) petechial, (*f*) hæmorrhagic, (*g*) corymbose varieties.

The unmodified is natural small-pox. The modified form is exhibited when small-pox attacks individuals who have been properly vaccinated, or those who have had previous attacks of small-pox. In this latter form the symptoms are modified in degree not in kind. The duration of the whole disease is short. It is otherwise called varioloid small-pox. The prodromal stage is very short and mild, rarely severe; the fever moderate in the initial stage. An erythematous rash often precedes the eruption and forms large red spots, which may be diffused over the body, particularly over the limbs. The papules are scattered and somewhat irregular in their order of appearance, and they run through their phases very rapidly. They rarely become confluent. The eruption passes through its stages sooner than in variola; it is matured and declines by the sixth or seventh day. With the termination of the eruption the fever ceases and the patient is free from all urgent symptoms. The maturation stage is mild and the affections of the mucous membrane are comparatively slight. The suppurative stage soon ends in desiccation, in five or six days. Very few pustules are ruptured; they generally dry up, their contents forming brown scabs, which fall off in three or four days, leaving red spots. They seldom leave cicatrices. There is neither characteristic odour of breath nor secondary fever.

In the *Discrete* form the pustules are few, distinct, and separate from each other. The *secondary fever* is very slight in these cases. From the initial fever one cannot predict the type of smallpox, for often in the discrete variety the initial fever and other symptoms may run alarmingly high. On the other hand, in the confluent form, and even in the hæmorrhagic variety, the precursory fever may be only slight.

In the *Confluent* variety the eruption is abundant and the pustules run together over the greater part of the body, coalescing and losing their regularity. The earlier the eruption and the more pustules there are on the face the more likely is the disease to become confluent. It is a more severe form than the discrete. During the eruptive stage there is active inflammation of the skin and deeper structures. The skin is also thick and swollen, and hard dark papules or vesicles cover all parts of the body, the vesicles are usually flattened in and soon become pustules which contain fluid of a brown colour; the secondary fever is very high. The edges of vesicles coalesce, leaving no portion of natural skin to form areolæ, which are therefore absent. The pustules are not well developed; they remain sluggish and flat, contain ill-formed pus, as best seen on the hands and face. They often run together and form bullæ of several inches in extent. Sometimes the loose cuticle is rubbed off by movements in bed or by scratching, and the denuded surface then discharges serous and sanious fluid. On the fifth day of the eruption the face swells, the eyelids become tumid, the tonsils and parotids swollen, the limbs also swell, and the patient if a child often suffers from diarrhœa, or if an adult from salivation.

In this variety, when the maturation stage is reached, the eruptions extend more deeply as well as superficially, and during the desiccation stage they form thick dark crusts. Those on the face cover it like a mask. In many cases cracks form on the pustules and crusts, and pus trickles out. When the crusts separate they leave extensive cicatrices causing great disfigurement. In this variety the secondary fever and the associated local lesions are very intense and marked, and disappear very slowly. The urine is scanty, high coloured, with excess of urea and uric acid, and a trace of albumen, of blood-corpuscles, and epithelial cells or casts. In unfavorable cases there is extreme prostration, great restlessness, great difficulty of swallowing, hoarseness of voice, dyspnœa, and sometimes œdema of the glottis, and death from suffocation.

In this variety the fever does not abate with the eruption, on the contrary, it becomes increased and continues throughout the disease.

The *Abortive* form is that in which only nodules remain or where only vesicles or few pustules form; the eruption scarcely passing beyond the vesicular stage.

Hæmorrhagic.—Petechial points appear and reddish fluid is mixed with the contents of the pustules, or the contents of the pustules are really bloody. Hæmorrhagic or malignant smallpox is rare and is now seldom seen. In it the blood is effused into the vesicles or pustules, and there is a tendency to hæmorrhage from the mucous surfaces. Its period of *incubation* is short. The *invasion* is characterised by delirium, a badly developed pulse, prostration, sleeplessness, and hæmorrhages (hæmaturia, melæna, &c.) from the mucous surfaces. This form occurs only in very debilitated persons. At first the patient feels as if small shots were embedded in his skin, and generally a red rash, resembling that of measles, appears before the eruption begins. This is soon followed by papules, which pass into vesicles, containing bloody fluid instead of lymph. These do not become pustules, but remain flat, irregular, and flabby. Petechiæ or purpureal stains are often found on the thighs and abdomen. Hæmorrhage beneath the conjunctivæ, and from the bowels, kidneys, or nose, takes place. Death is preceded by coma or by extreme adynamic symptoms.

Corymbose.—This variety is seldom seen. When it occurs some of the pustules assume the form of clusters like a bunch of grapes.

Complications of smallpox generally occur during the maturation stage. These are: 1. Erysipelas. 2. Affections of the lymphatics. 3. Ulcers through the cornea. 4. Suppuration of the internal ear. 5. Cerebral abscesses. 6. Pleuro-pneumonia; and 7. Pyæmia. In the confluent variety albuminuria is as common as in scarlet fever, and if recovery takes place permanent blindness, deafness, or lameness may remain.

Sequelæ.—Anæmia is a sequel of the majority of cases of smallpox; phthisis often follows in the adult. Blindness from destruction of the cornea and deafness from suppuration of the internal ear, are occasional sequelæ.

Diagnosis.—The eruption of smallpox may be confused with that of chicken-pox, or mistaken for a cutaneous disease, or *vice versâ.* When the history of infection is not clear, but febrile symptoms are present, a well-marked vaccination scar will incline the probability towards chicken-pox. Chicken-pox may be distinguished from the majority of cases of smallpox by the comparative mildness of the initial symptoms, but an experienced person will often be obliged to suspend his judgment between varicella and varioloid, and will, of course, take the precautions proper to the latter disease. The absence of raised temperature or of a history of rigors will prevent the confusion of any skin disease with smallpox; but since the patient is always better when the rash of smallpox appears, the mere fact that he is able to go about ought not to lead the physician to conclude that a mere skin disease is before him. In London, patients with syphilitic rashes have frequently been sent to the smallpox hospital, and patients with smallpox into the syphilitic wards of general hospitals. When an epidemic of smallpox is raging, there is danger that all patients who have had a severe rigor with pains in the back should be taken to be cases of commencing smallpox. It should be remembered that these symptoms are common in some other febrile diseases, and especially in quinsy. The fall of temperature after a purge will usually indicate the true character of quinsy where the throat may not have afforded conclusive evidence.

Prognosis.—Persons who have been vaccinated rarely die of smallpox. Among unvaccinated patients aboriginal races show the largest proportion of deaths. The *discrete* variety of smallpox is not dangerous as a rule. The more pustules there are on the face the more dangerous the case is. Numerous pustules on the body do not seem to indicate danger. The earlier the eruption appears the more serious the case is likely to be. The persistence of secondary fever is always serious. In pregnant women the disease is always dangerous; abortion usually takes place.

Treatment for smallpox.—The attack cannot be arrested. If the patient be vaccinated seven days or more before the appearance of the eruption, the disease will be modified. All unprotected persons should be vaccinated as soon as smallpox has appeared in their neighbourhood. Revaccination should also be practised. The treatment of smallpox is that of all fevers, except that in mild cases the patient may be allowed to get up and walk about his room. Animal food should be strictly avoided. The patient should be kept cool and clean. Isolation is of course necessary. During the prodromal stage the patient should be kept in a well-ventilated room, and cool drinks allowed. For headache and delirium ice may be applied to the head. Sydenham recommends roast apples during the eruptive stage, and any light solid food may be taken. In England the old plan was to wrap the patients up in flannel, and keep the windows and doors shut. Sydenham, about the time Bombay was acquired by the English, introduced fresh air as a therapeutic agent in the treatment of smallpox, and in his practice a diminution of mortality was rapidly apparent. The immense success of Dr. Radcliffe, who followed the same improved system in the reigns of William III and Queen Anne, completely established the plan of keeping smallpox patients in well-ventilated and not in close rooms.

If the fever be high, saline diaphoretics, and even antimonial wine may be given with benefit. Quinine, in full doses, has been strongly recommended. In the *confluent* variety stimulants with bark and ammonia may be employed. Where the eruption, after having made its appearance, recedes suddenly, apply mustard to the calves of the legs and to the soles of the feet, and also give stimulants with camphor and aromatics internally. Where the glands of the mouth and throat are inflamed a warm poultice made of half linseed and half wheat-flour may be applied to the throat. Opium should not be used if there is any tendency to coma. In cases where the excitement is considerable, and also during the maturation stage, it is a very efficacious remedy for allaying restlessness. Cold compresses and mercurial applications are recommended for the prevention of disfigurement from pitting and cicatrisation. The face may be covered with mercurial plaster, or solution of bichloride of mercury (gr. j to ℥ij) may be used for wetting a compress. To prevent pitting many other plans have been proposed, none of which are effectual. Some cover the face with various plasters to exclude the action of light and air, some recommend applications of collodion to the pustules.

The patient should be directed to abstain from scratching the eruption. If the throat be sore from pustules on its mucous membrane an antiseptic gargle may be used. Inhalation of steam sometimes mitigates the distress. For dangerous dyspnœa give an emetic of sulphate of copper and apply locally nitrate of silver solution to the throat. Pneumonia and pleurisy require regular treatment as given in the chapters on those diseases. In the stage of desiccation the diet should be of a nutritious character; stimulants and tonics are generally advantageous.

Inoculation.—The practice of inoculation as a prophylactic against smallpox is now illegal. That it was more or less efficacious in abating the ravages of the disease may be gathered from various passages in the literature of the period in which it was practised. Thus, Mrs. Hardcastle, in Goldsmith's comedy of "She Stoops to Conquer" (1773), says, "I vow since inoculation began there is no such thing to be seen as a plain woman, so one must dress a little particular or one may escape in the crowd."

Cow-pox. Vaccinia (Vaccine Disease).

Cow-pox, otherwise called vaccinia (*vacca*, cow), is a modification of smallpox. It is produced by inoculating a virus called vaccine matter, taken directly or indirectly from the cow. The morbid secretion of the cow is capable of transplantation to the human frame and of exciting a like disease. The resulting affection subsequently protects the human body from the ravages of smallpox. Vaccinia is an excessively infectious disease. The contents of the vaccine pustules are the only known medium of contagion. The emanations from the skin or lungs have no infectious properties. The vaccine poison manifests its effects at the point where it is introduced, and not at other remote parts. Sometimes eczema or lichen appears in the vicinity of the pustules. Efficient vaccination confers immunity from smallpox except in a few cases, and in these the modified form appears. It is necessary that vaccination should be repeated from time to time. The predisposition to vaccinia is general in persons who have not already been vaccinated, and even in them after a time attempts at revaccination are successful in the majority of cases.

Discovery of vaccination.—Some knowledge of the nature of the vaccine disease and its power to protect the human constitution against smallpox led Dr. Jenner to proclaim its virtues to the world. Dr. Jenner learned that there existed in certain parts of England a belief that persons contracted a vesicular disease from the udder of the cow, and were thereby protected from an attack of smallpox. In order to increase the utility of this protective means Dr. Jenner tried whether it could not be transmitted from person to person. He therefore took the matter from the hands of a milker, and vaccinated a child. The child showed the effects of the disorder in the most satisfactory manner. This was done on the 14th May, 1796. On the 1st July the same child was inoculated with smallpox matter, and he resisted the contagion entirely.

Dr. Jenner thus satisfactorily ascertained that it was a milder affection than smallpox; that it secured those who had had it from subsequent attacks of the latter disease, and that it might be inoculated in one member of a family without danger of attacking others. The horn of the cow from which Dr. Jenner made his experiment is preserved, with an appropriate inscription upon a gold plate, in the library of the Royal College of Physicians of London.

Period of vaccination.—The usual time for vaccination is when the child is from six to eight weeks old. It may be done earlier if an epidemic of smallpox prevails. It should always be postponed till the second or third year if the children are weakly and inclined to scrofula.

Symptoms.—There is no prodromal stage. The third day after the lymph from a vaccine vesicle is introduced beneath the skin of a healthy child certain changes are noticed at the point of inoculation. These resemble those of smallpox but with this difference, that in cow-pox the changes are observed at the point of vaccination and confined to that point. A slight redness first appears, due to inflammation caused by the puncture. This redness disappears in twenty-four hours, and a little nodule or mark is left. On the third day after the operation the specific effects appear as a little red, hard elevation, surrounded by erythematous redness; over this point the cuticle is raised or elevated, the *vesicle* being only apparent under the microscope. On the fifth or sixth day after the puncture a distinct pink-coloured vesicle forms, and is apparent to the naked eye; at first it is circular without elevated edges, and on the seventh day it has a depression in the centre. It is umbilicated, and has a cellular formation. The umbilication depends on the puncture made. The puncture sets up inflammation of the skin, and the inflammatory lymph causes adhesion between the epidermis and the cutis at the point of puncture. The subsequent effusion around the puncture causes the two membranes to swell, and hence we find umbilication corresponding only to the wound. The depression is round in cases of vaccination performed by punctures, and oval where the matter is introduced through an incision. It is surrounded by a narrow ring of inflammation. The vesicle is a collection of loculi or cells, in fact, about eight or ten in number, and from the walls and floor of which lymph is secreted. The contents of the vesicle are clear lymph, transparent serum, and elementary granules of less definite structure, and looking like white blood corpuscles. On the eighth day the red ring, which was before small, now forms an areola round the vesicle. On the ninth day the latter reaches its highest development, and then it changes in colour from pink to a pearly hue. The vesicles change into pustules. In some cases there is a dark coloured *scab* in the centre, formed by the drying up of a minute quantity of blood from the puncture or of the dissolved virus which had not been absorbed. The areola during the ninth or tenth day forms a scarlet circle perhaps two inches in diameter. The colour is intense at the edge of the vesicle, and fades towards its outermost boundary. The skin on which the vesicle is seated, and also a short distance beyond it, now becomes dark and tumefied. The disease is at its height on the tenth day, after which it begins to subside. The areola disappears entirely on the tenth or eleventh day, and the pustules, which have by this time acquired a brown colour, now begin to dry up and form a scab or crust with a minute quantity of pus beneath. Desiccation goes on rapidly, and on about the twentieth day the scab falls off, leaving a permanent white, circular, depressed, striated cicatrix with a ridgy base, in which there are numerous pits. During maturation there is often heat, itching, and pain in the inflamed part, and difficulty in moving the limb. The lymphatic glands in the axilla also swell, and the temperature rises several degrees.

Performance of safe vaccination.—Extreme care must be taken in vaccination, so that no animal matter except the pure and clear lymph is inserted. The lymph should be taken on the eighth day from a healthy child, and from a well-formed vesicle, and arm to arm vaccination is the best practice. The child yielding the lymph should, if possible, be more than two and less than six months old. The carelessness of the operators, and not the process of vaccination, deserves to be blamed when anything but vaccine is introduced. Bad results follow from employing lymph and blood mixed; or lymph taken from a diseased subject. In order to avoid all these evils the vaccinating needle or lancet must be perfectly clean. The subject to be vaccinated and the source of the lymph should be both healthy and free from any trace of skin-disease. The lymph should be taken from a child who has been vaccinated for the first time, as the lymph taken from a revaccinated person is less certain in its effects.

If fresh lymph cannot be obtained, lymph well preserved in hermetically sealed capillary tubes is the next best. Where economy is the object the lymph may be diluted with two parts of glycerine and two parts distilled water. Lymph is apt to be spoiled by keeping, but tube-preserved lymph may be relied upon. Lymph should be taken from a pock of normal size, form, and areola. Five punctures should be made, allowing sufficient space between each puncture. During an epidemic of smallpox all those who have been vaccinated more than seven years previously should be revaccinated. The pock should be preserved from pressure and friction or from scratching. If there be much inflammation of the skin round the pock, cold water or lead water compresses may be applied. Direct vaccination from arm to arm is by far more effective than even that with lymph from a cow. Statistics have proved that animal vaccination by the successive transmission of vaccination from calf to calf, and from the calf to the human subject, has been attended with occasional failures. *Susceptibility* varies with the constitution of the individual and with the family. Some never receive it, however frequently vaccinated; others receive it with difficulty, requiring several operations before its effects are manifested; in others, again, the smallest amount of virus produces the disease with the greatest certainty. In many cases the susceptibility varies in the same person at different times; you may vaccinate him several times without success, but wait a few weeks and then revaccinate, and the operation will succeed. Certain eruptions previously existing upon the surface may prevent the reception of vaccination, *e.g.* eczema, impetigo, &c. In order to ensure a safe and efficient vaccination, four or five separate punctures or scratches are required to be made; three are usually made on one arm and two on the other. It affords protection against infection for a period of from seven to ten years, sometimes for a longer time, but it is always better to revaccinate after that period.

Successful vaccination.—On the ninth day the clear contents of the vesicle become cloudy. On the tenth or eleventh day the pustules are formed. These terminate in crusts which fall off in the course of the third week, leaving scars or pits.

Anomalies of vaccination.—These are illustrated by—1, the degree and severity of local and general symptoms; 2, the appearances presented by the pock; 3, the duration of the phenomena; 4, the degree of protection afforded to the constitution.

1. *Degree and severity of general and local symptoms.*—Where the virus employed is fresh from the cow the specific inflammation is very severe; the arm swells, axillary glands enlarge, and even fever sets in, but in many cases no serious effects are produced.

2. *Appearances presented by the pock.*—It may be only a simple vesicle, or a vesicle broken by scratching, so that it loses a portion of its clear contents, and is not circular and umbilicated. The areola may be irregular and premature, yellowish and opaque. Occasionally the body becomes covered with papular eruptions only, which never go on to vesicles, pustules, or scabs.

3. *Duration of the phenomena.*—The progress is retarded in cases where the vesicles do not appear till the sixth or eighth day or even later, after which period the disease runs its regular course.

4. *Constitution protected or not.*—The protection is very slight or altogether absent when the operation is followed in a day or two by changes which take place sooner than usual, and run their course very rapidly. Inflammation in the punctures and appearance of pustules may exist without the formation of vesicles. The pustules are irregular, yellow, readily broken down, and terminate in a crust, which falls off about the sixth or seventh day. This is otherwise known as *spurious* or incomplete vaccination.

Sequelæ of vaccination.—Under vaccination the system suffers very little. Between the sixth and ninth day there is slight primary fever, and sometimes there may be eruption of roseola or lichen for about a week. Vaccination is sometimes, though rarely, followed by *erysipelas* and *sloughing sores* at the seat of puncture and the surrounding parts. During maturation the puncture becomes much inflamed, a pustule rapidly forms, discharging unhealthy fluid, and soon changes into a dark scab, from beneath the surface of which the pus gradually exudes; the scab then becomes detached and leaves an unhealthy and rapidly spreading sore. Such cases occur in those who are ill-fed and neglected, and live in filthy localities. Vaccination sometimes endangers life. It is also sometimes followed by permanent bad health; scrofula and skin diseases sometimes become developed. The occurrence of scrofula in children after vaccination is supposed to be due to the debilitating influence of the fever which accompanies vaccinia. In weakly children skin diseases—eczema, for example—are apt to follow the application of any irritant to the skin. Unless circumstances are urgent it is better not to vaccinate scrofulous children until after the teeth have appeared. The period of weaning should be avoided for the operation.

Compulsory vaccination has now been introduced into Bombay, and public vaccinators are appointed for different districts. It is gratifying to find that the majority of parents are always anxious to have their children vaccinated, and that it is only a few who, from mere prejudice or religious scruples, object thus to procure safety for their children.

MEASLES. RUBEOLA. MORBILLI.

Measles is an epidemic and peculiarly contagious disease; the infection is chiefly in the breath and perspiration, the disease does not occur spontaneously. In every case of measles the infection has been derived directly or indirectly from another person. What the infecting material is has not been discovered. Its contagious character is demonstrated by its transmissibility from a person affected with measles to a healthy person. The poison is capable of multiplication and reproduction in the body of the infected person. Its contagion is so powerful that when mixed freely with air it does not lose its activity, and can be communicated to others by the body and clothes of healthy persons who have been near a patient affected with measles. The disease is most infectious during the incubation stage and while the eruption is out, and hence the necessity of keeping children affected with the complaint free from contact with healthy ones. During the prodromal stage, when the patient suffers from catarrh and cough, he should at once be separated from other children. The predisposition to the disease is very extended, no one is exempt from it unless protected by a previous attack. It is most common in children, and it occurs, as a rule, only once during life. Children under six months generally escape; very old persons are rarely attacked. The affection is characterised by nasal catarrh, sneezing, and running from the eyes, dry cough, and hoarseness of voice, aching in the limbs, some sore-throat or diarrhœa, continued fever, and a peculiar rose-coloured rash scattered over the skin. The *rash* appears on the fourth day of the fever on the face, usually on the forehead and chin, whence it extends over the whole body, in the form of soft, circular, very slightly elevated, dusky-red spots, which soon coalesce into crescents, and it ends on the seventh day by desquamation. Between the patches the skin is normal. The fever does not subside when the eruption appears.

Varieties.—These are three; (1) the common or simple form, (2) the inflammatory, and (3) the asthenic or typhous.

Rubeola vulgaris. Symptoms.—Incubation lasts from ten to fourteen days, during which period the patient may suffer from languor, lassitude, sense of discomfort and cough. Very often the patient during the period of incubation enjoys good health. This is followed by the prodromal stage or stage of invasion. During an epidemic, or when the disease exists in the neighbourhood, the setting in of measles is generally marked by decided local symptoms.

The *Invasion* is characterised by repeated rigors, flushing of face, and catarrh of the mucous membrane of the eyes, nose, fauces, larynx, and bronchi. The conjunctivæ and the pituitary membrane are affected; the eyes are suffused, burning, and intolerant of light. The patient also complains of severe headache (frontal), swelling of lids or face, troublesome sneezing with coryza. Sometimes there is epistaxis, great dyspnœa, hoarseness of voice, and hacking or hoarse and barking cough. There is high fever on the second day and various nervous derangements, as headache, disturbed sleep, confused mind and drowsiness, but no delirium except in severe cases. Derangement of the stomach causes nausea, retching, vomiting, and diarrhœa; the tongue is furred and white all over. In children convulsions may precede the eruption, and occasionally there is bleeding from the nose. The stage of invasion lasts from three to four days. All these symptoms become aggravated towards the evening.

The eruption appears on the fourth day of the fever as numerous small circular dots or red spots, having a small papule at the middle. In some places they coalesce and form blotches of a raspberry colour, of a horseshoe or crescentic shape, and slightly raised above the surface of the skin. Between the spots the skin is of a normal colour. The face is somewhat swollen. The eruption appears first on the chin, cheeks, eyelids, forehead, or face, and spreads downwards over the body and to the arms and legs. The eruption varies; in some cases it becomes confluent, but even then the diffuse redness presents an irregularly spotted appearance. Sometimes the spots are dark or dirty brown owing to extravasation of blood into the cutis and there may be also petechiæ between the spots. These spots attain their greatest intensity on the fourth day from their eruption and they then gradually fade. They begin to die away first from the face and then from the breast. Their disappearance is attended with slight branny desquamation of the cuticle and with considerable itching. With the desquamation diarrhœa is very common. The catarrhal and other constitutional symptoms increase until the eruption has reached its height. In some cases the eruption is retarded, and in others it even recedes almost at once after appearance. The fever does not abate on the appearance of the eruption, it exacerbates or augments, so that a very high temperature is attained. The pulse becomes more frequent. The skin is covered with red spots; irritation of the eyes and nose, and the coryza continue, but are less severe; the secretion from the nose becomes scanty and thick; the face, eyelids, and cheeks look red, humid, and turgid. The cough is less troublesome and looser.

In ordinary cases of measles the patient may be very ill on the first day of the invasion, but on the second or third day he is often doing well, on the fourth day again all the symptoms become aggravated; there is lacrymation, nasal discharges, swelling and smarting of the eyes, cough, and fever; the breathing becomes hurried, and eruptions begin to appear on the forehead. On the sixth day the complaint is at its height, but on the seventh or eighth day the temperature begins to fall and the symptoms gradually abate or disappear. The temperature rises rapidly at first, and may be as high as 103° or 104° on the fifth day; it then falls again, when the eruption begins to decline. In some rare or anomalous cases of measles the eruptions first appear on the legs or arms, and then spread. Rarely, also, the eruption appears on a limited spot, and is very indistinct on the rest of the body. Sometimes measles appear without eruption, very severe catarrhal symptoms being the main features of the complaint. Cases also occur where the eruption appears slowly and lasts for three or four days. The last spots appear when the first ones are fading away. Desquamation sets in on the eighth or ninth day of the disease. It is more marked on the face, neck, and hands than on other parts which are covered by clothes and not exposed to the air. With this stage fever and catarrh and other symptoms disappear.

Rubeola synocha, inflammatory, or hæmorrhagic measles.—In it the eruption is of a dark purple colour. The constitutional fever and other symptoms are very violent. The spots are confluent and do not lose colour in twenty-four hours as in rubeola vulgaris. They grow darker and remain so for five or six days. The spots do not disappear under pressure. This is owing to partial rupture of the overfilled capillaries. This condition is analogous to hæmorrhages occurring in inflammatory disturbance of nutrition. It often runs a favorable course. The fever symptoms are violent; pulse is 120 to 130 in a minute, temp. 103° or 104°. The local affections of the mucous membrane of the air-passages are due to croupous and not to catarrhal changes, as in the simple form. The affection also extends to the stomach and intestines. The catarrh often extends to the finer bronchi and gives rise to capillary bronchitis. It also leads to catarrhal pneumonia and collapse of the lung. In such cases the eruption becomes pale, and may entirely disappear in a short time.

Rubeola maligna.—It is another variety of measles, described as asthenic or typhous measles. It may be epidemic or sporadic. This form is extremely dangerous, danger being due to the poisonous effect of the infection on the whole system.

Symptoms.—These are adynamic from the first; they are generally associated with a vitiated state of the constitution or some unfavorable hygienic condition. In the prodromal stage the pulse becomes small, weak, and frequent; there is great prostration and depression of spirits; the tongue is dry and brown; there is oppression of the chest, often associated with dyspnœa, delirium, or stupor. Very often patients die before the eruption appears. Sometimes these symptoms are accompanied by petechiæ over the body, or there is soreness of the fauces with abundant bloody discharge from the nose or the intestines. The eruption comes out slowly and imperfectly, is of a pale red or dark purple colour, and with the eruption the dangerous typhoid symptoms make their appearance. The pulse then becomes extremely feeble and frequent, the limbs are cold and perspiring, while the belly is hot, and the patient dies in a soporose condition with or without convulsions. Death occurs from exhaustion or from congestion of the brain or lungs, or from hæmorrhage from the mucous surfaces.

Complications.—Inflammation of the lungs (pneumonia), catarrhal or croupous inflammation of the larynx and of the bronchial tubes. Sometimes there is permanent distension of the alveoli (acute vesicular emphysema), and there may be collapse of the lung. Congestion of mucous membrane of small intestines, ophthalmia, phthisis, and other tubercular manifestations, as tubercular meningitis, are also common. A form of periostitis has characterised some epidemics. The chief precautions ought to be directed against lung-complications. In adults particularly measles are very often followed by phthisis.

Sequelæ.—Measles is apt to be followed by various chronic affections. One sequela of measles is a long series of scrofulous diseases, as swelling and inflammation of joints and periosteum, otorrhœa, eczema of the scalp, and ophthalmia. The child after measles often becomes scrofulous. After extensive epidemics of measles pulmonary consumption is a common sequel. It is due in these cases to caseous metamorphosis and disintegration of the products of lobular pneumonia, which is also associated with degeneration of the bronchial glands.

Prognosis is *favorable* when the initial stage is of proper duration, the fever moderate, the eruption appears first on the face and decreases after two or three days, when the fever diminishes with the eruption, and cough diminishes with the fever, and there is gentle diarrhœa. Convulsions towards the decline are much more serious than when they set in at the onset. The *unfavorable* cases are marked by the severity and continuance of the initial stage, high fever, parched skin, hurried breathing, severe diarrhœa, extreme irritability. The postponement of the eruption or a livid hue, or its irregular appearance or sudden disappearance, and lung-complication are dangerous symptoms. Pneumonia or great prostration, severe dyspnœa, restlessness, delirium or coma, make the prognosis extremely grave.

Diagnosis.—Scarlet fever is the only disease with which measles can be confounded. In measles the fever is of shorter duration. The eruption appears as late as the fourth day of the fever. In scarlatina the eruption appears on the second day of the fever, which continues for many days or some weeks. In measles there are affections of the mucous membrane of the eyes and nose; in scarlatina the eyes are free from signs of coryza, but there is soreness of throat. In measles the temperature is less elevated, the pulse is rarely so rapid, and delirium and convulsions are less apt to occur. The eruption appears in crescentic patches, is pinkish-red in colour; in scarlatina the patches are large and bright red. There is always more or less cough in cases of measles.

Treatment.—By way of prophylaxis healthy children should be prevented from coming in contact with the sick, or with those showing any of the prodromal symptoms of measles. If a severe epidemic is prevailing in a certain locality children should be removed from that place to some other far distant. The disease is generally mild in type, but the tendency to spread is very decided.

Inoculation is not resorted to, as it has no effect in lessening the force of the poison as is the case with smallpox. The disease once established runs through all its phases, and hence interference is unnecessary and even useless. Most frequently the danger in measles is due to chest-complications; every care should be taken to prevent these from occurring.

Exposure to cold must be avoided; the room should be kept well ventilated and at a temperature of about 65° if possible. The skin must be kept clean; the patient's body should be washed daily with luke-warm water, care being taken to avoid exposure to cold air. The bed-clothes should also be frequently changed. If conjunctivitis is excessive keep the room dark. Thirst may be quenched by cooling drinks. The diet should be of a liquid, non-stimulating character; at first it should be low and gradually increased when the febrile symptoms subside. The bowels should be kept open. During convalescence, or after the disease has subsided, take care not to allow the patient to go out of doors too soon, he should be kept in his room while the desquamation is going on, or any catarrh or cough exists. During convalescence nutritious diet, tonics, and animal food are indicated; tepid baths are also recommended. The patient should be carefully watched, and if any cough exist it should be checked at once. The disappearance or retardation of the eruption soon after it has appeared, indicates that the patient is in a state of general collapse in which the skin participates, or that some complication has set in. It is useless to attempt to restore the eruption by hot baths and the like; stimulants are generally indicated. Adynamic symptoms, as in rubeola maligna, should be treated with stimulants and good food. During the initial stage, for laryngeal catarrh, hoarse voice, and dyspnœa, give an emetic of ipecacuanha, apply mustard poultices to the throat, and round the neck. When the cough is troublesome and prevents the patient from sleeping give Dover's powder two or three times a day, or one full dose at bedtime. In children lactucarium or bromide of potassium should be preferred to opium. In asthenic cases quinine, nitric acid, and nux vomica may be given. If convulsions occur, hot foot-baths or mustard plasters to the legs are the most suitable remedies.

EPIDEMIC ROSEOLA, RÖTHELN, RUBEOLA NOTHA, GERMAN MEASLES.

Epidemic roseola is a contagious disorder often confounded with measles. It is a specific eruptive fever most common in hot seasons and affecting children more frequently than adults. Some observers deny the existence of any special disease of this character, and believe that the cases that have been described are really instances of slight measles, with absence of, or only very slight, catarrh, or of imperfectly developed scarlatina, or of urticaria. Others again have regarded rötheln as a hybrid affection allied to measles and scarlatina. This opinion is founded on the fact that one class of cases resembles the former affection as regards the eruption, while the high fever, the throat affection, and the occasional occurrence of dropsy, indicate the connection with scarlet fever. In a second class the eruption becomes confluent and thus resembles that of scarlatina, while the pulmonary affections are similar to those of measles. On the other hand, the independent character of the disease has been demonstrated by numerous observers, and several epidemics of rötheln have been placed on record. The symptoms are altogether milder and of much shorter duration than those of measles; the febrile movement is slight and soon passes off. Children who have already had measles are by no means exempt from an attack of rötheln, and it is very probable that the accounts of children suffering from two attacks of measles in rapid succession are to be explained by this fact. The same holds good with regard to scarlet fever; attacks of rötheln confer no immunity against subsequent attacks of the latter disease and *vice versâ.*

Symptoms.—The incubation period lasts from ten to fourteen days or possibly a few days longer. Diarrhœa or convulsions in children, and slight headache, occasional rigors in adults, and in both, nasal catarrh are the usual symptoms of the invasion. The initiatory fever is generally short, and often altogether absent. There is usually more or less cough and soreness of the throat. The latter symptom has especially characterised some epidemics. Rheumatic pain in the limbs, vomiting and drowsiness are occasionally observed in adult cases.

Eruption.—The eruption appears suddenly on the third or fourth day of the febrile stage. It usually breaks out at once over the whole body, is at its height on the second day, and then rapidly disappears. The rash consists of spots, at first crimson then of a dusky red or purplish hue, forming patches of irregular shape, not crescentic, but with obtuse angles. The size of the patches varies, in general they are as large as a sixpence, but sometimes they coalesce over a large surface. The rash is somewhat elevated above the adjacent skin. Sometimes the abdomen is the part most covered. Sometimes the eruption is most marked on the face and neck and upper extremities. The redness gradually shades off into the surrounding skin. The stage of decline is attended with considerable itching, followed by desquamation, which begins in the centre of the patch and gradually extends towards the circumference. The cuticle is detached in minute portions resembling scales of fine bran. The disease runs its course in a few days, but in severe cases, which are rare, the eruption may remain out for ten days. Recovery is the rule, but the disease, in a small minority of cases, terminates fatally. Death is usually due to convulsions and subsequent coma.

Diagnosis.—From measles. All the symptoms are usually much milder and the rash is of much shorter duration. There is no soreness of the eyes, no lacrymation, no sneezing. The rash breaks out more uniformly all over the body and is not in crescentic patches. From scarlatina. The rash is always more confined to patches. The tongue is but little furred and presents no strawberry appearance. The temperature never exceeds 100°, and rarely reaches that height. The disease is far less contagious than scarlatina.

Treatment.—The treatment is similar to that of mild cases of measles or scarlet fever. The patient should of course be isolated. Diaphoretics, as solution of acetate of ammonia, cooling drinks, low diet, and confinement to bed, while the symptoms are acute, are all that is necessary. Sequelæ are extremely rare, but dropsy, swelling and suppuration of the cervical glands, have been occasionally noticed.

CONTINUED FEVERS.

The term "continued fevers" is applied to that class in which the febrile movement runs a regular course from beginning to end, as distinguished from malarious fevers in which there are distinct remissions or intermissions. The class includes eruptive fevers, as chicken-pox, scarlet fever, smallpox, measles, and also typhoid, typhus, and relapsing fevers, and simple continued fever.

The simple continued fever is non-contagious. It is that mild feverish attack which accompanies in some degree every catarrh of a mucous membrane. It does not set in with prodromic symptoms as languor, depression of spirits, pain in the back, headache, &c. It runs an uncomplicated course, and presents no other symptoms than those due to speedy rise of temperature. This is sometimes as high as 104° F. The symptoms may, especially in children, be produced by very slight errors in diet, over-fatigue, exposure to heat, &c., but may nevertheless be indications of some grave disorder, and cannot, therefore, be watched too closely; and in young persons this fever though so slight may be associated with delirium. The disease lasts from one to ten days. When it lasts only for a day it is known as ephemeral fever. It can easily be distinguished from the typhoid, typhus, and relapsing fevers, by the absence of the abdominal symptoms of typhoid, of the cerebral symptoms of typhus, and of the arthritic and muscular pains which are characteristic of relapsing fever.

Many cases of fever in India depend only on general debility or a peculiar diathesis, and not on any specific poison, as marsh poison or malaria; many cases of so-called intermittent fevers are due only to such causes. The fever in such cases usually comes on directly after exposure to the sun's rays, and during the months of April, May, June, and October. The attacks yield readily to stimulants and nourishing diet. Several eminent practitioners refer such cases to impaired nutrition, as a result of poor state of blood brought on by privations and want of animal and fresh vegetable diet. It is a well-established fact that the inhabitants of the tropics are, in a large majority of cases, the subjects of a scorbutic diathesis, of syphilitic and mercurial cachexia, and of debility from heat. Often as an accompaniment of such fevers, and sometimes without any febrile phenomena being present, enlargement of the liver and spleen occurs, as during the progress or after the attacks of remittent or intermittent fever. In these cases the enlargement is due to hyperæmia and excessive formation or accumulation of the cellular elements. Such enlargements are generally permanent, and can be removed only by a slow process of absorption and by improving the deteriorated state of the blood.

Besides these milder forms there is one common in the tropics, and in which all the symptoms are more severe. It is called *ardent continued fever*. The patient complains of heat, burning, and dryness in the palms of the hands and in the soles of the feet; there is more or less general uneasiness and headache. Fever commences without any warning, or it may be preceded by coldness of the back and chills or rigors. Other premonitory symptoms are lassitude, disinclination to work, frontal headache, vomiting, loss of appetite, and aching of the back. These symptoms last for a short time, when the chilliness disappears. The face now becomes flushed and the conjunctivæ red. The skin is hot, temp. 102° or 104°, pulse frequent, full, and firm. There is no characteristic eruption, but a crop of herpes labialis appears on the lower lip. The headache increases, there is restlessness and ringing in the ears. The tongue is furred in the centre and red at the tip and edges, and often dry; there is great thirst; the urine is scanty and high-coloured. The fever is often associated with slight delirium.

All these symptoms become aggravated at night, but towards morning they generally remit and the patient feels easier than on the previous day. The disease continues for several days, usually for a week, at the end of which period all the symptoms abate, and then a profuse sweating indicates an approach towards recovery. In some cases the crisis sets in with epistaxis or hæmorrhage from the bowels, or diarrhœa, or the patient may pass large quantities of urine loaded with urates. All throughout there is no evidence of any local affection. When death takes place it is preceded by symptoms of coma.

Treatment.—Emetics, purgatives, diaphoretics, and tepid sponging are employed with benefit. Eau-de-Cologne or ice constantly applied to the head will relieve the heat and pain. Quinine should be given when the distressing symptoms have subsided. Where the fever recurs from time to time, attempts should be made to improve the general health. A thorough change of climate is always beneficial, very often a sea voyage should be suggested. Warm baths and tonics are always desirable.

TYPHUS FEVER (GAOL FEVER).

Typhus fever, from Tuphos, a Greek word allied to the Sanscrit Dhoopa (sun-ache), is a disease generated by overcrowding of human beings with deficient ventilation; it often prevails in an epidemic form and is communicable by contagion. Its symptoms closely resemble those of abdominal typhus, or enteric fever, with which it was formerly confounded. It is a continued fever, eminently contagious, and also infectious. The contagion is found in the atmosphere, and attaches itself to the bedding, clothes, &c., of the patients. It may be carried by patients' friends to places far distant. In crowded and ill-ventilated places the contagion is stronger and its effects most marked. It is supposed to be due to miasm, but the germs which develop outside of the body are also reproduced in the bodies of patients suffering from typhus fever. In the majority of cases of typhus the specific poison is derived from persons suffering from the complaint, but numerous cases have occurred in which, after the most careful examination, no source of contagion could be traced. In these cases a *de novo* origin must be supposed. Instances of this character have repeatedly occurred in ships at sea, in over-crowded gaols and hospitals, and in famine districts. The disease often prevails epidemically during periods of general scarcity, and is an accompaniment of destitution. It is seldom seen in India. The duration is usually fourteen days; the attack ends in a definite crisis. The rate of mortality is often very high.

Causes.—The susceptibility to the disease is general, but early childhood, and extreme old age are comparatively exempt. More than half the cases occur between ten and thirty years of age.

Sex.—Males and females are alike affected.

Constitution.—The strong and healthy are less prone to be attacked than are the sickly and debilitated. The predisposition is increased by all depressing bodily or mental influences, such as intemperance, over-fatigue, bad food, lowering or exhausting diseases, over-crowding of houses, or accumulation of a large number of individuals in an ill-ventilated room. It is a disease of large towns, hard times, and of the winter season. It is almost unknown among the upper and middle classes, unless there has been direct intercourse with the sick. One attack usually protects the patient from subsequent invasion, but undoubted instances of second attacks have been observed.

Post-mortem appearances.—If death takes place early the body is little emaciated, the cadaveric rigidity is well marked, and there is extensive hypostatic congestion of the lungs and back; the muscles are dark-coloured; the heart contains dark-coloured blood; the bronchi contain much mucus, and the mucous membrane is injected; the lungs are collapsed in places and also hepatised in different parts; the spleen is enlarged and often soft and friable. Where patients have died at an advanced stage of the disease the rigor mortis is less marked. The body is much emaciated. The face is bluish looking and the gums and teeth covered with sordes. There is extensive hypostatic congestion in the lungs. The spleen is enlarged and displays injected bloody points (hæmorrhagic infarction), and also small abscesses. In still more advanced cases, in which death has taken place from the sequelæ, there are often suppurating glands in the neck, degenerated or diphtheritic inflammatory condition of the lungs, bedsores and gangrene of the limbs.

Symptoms.—Incubation is of uncertain duration, lasts from eight to nine days. During this stage the patient complains of slight chilliness, languor, depression of spirits, pain in the back, thirst, loss of appetite, restlessness, nausea, vomiting, headache, and cold creeping sensations over the body. All these symptoms are similar to those which precede other fevers. If there be an epidemic at the time, the onset of these symptoms should lead to the suspicion of the setting-in of typhus. The association of catarrh of the air-passages will tend to confirm the diagnosis.

Invasion.—In this stage, as in pneumonia, intermittent fever, and pyæmia, as distinguished from all other febrile disorders, there is a single protracted violent rigor, or repeated slight rigors, followed by a feeling of heat. After the rigor the patient feels extremely weak and fatigued. This is followed by symptoms of disturbed innervation. Thus the patient lies with his eyes open, but has a heavy, dull, apathetic look; he talks in his sleep or mutters deliriously. There is a dark flush over the face, the eyes are bloodshot. There is deafness, pain in the muscles, and trembling of the limbs on motion. The eyelids droop, there is a characteristic mousy odour of the skin, great muscular prostration, and irritability amounting to restlessness and wakefulness. He complains of severe headache and confusion of ideas. Very often headache alternates with bleeding from the nose. The rash, to be presently described, appears between the fourth and the seventh days. There are also signs of catarrh. The eyes appear full of tears. The nasal secretion is at first profuse, gradually it dries up and forms hard crusts. Swallowing is painful, the lips are dry and rough, the tongue is large and thickly coated, or dry, brown, and tremulous, and protruded with difficulty. The taste is slimy. The patient feels great thirst, has bilious vomiting, and total loss of appetite. The bowels are usually irregular, and there may be diarrhœa. The urine is scanty and of high specific gravity. In this stage the spleen is found to be enlarged. A more constant symptom is a hoarse cough; it is very painful, attended with mucous expectoration, streaked occasionally with blood. The skin is hot and dry, the pulse is rapid, full, large, and soft, often 100 to 120 per minute, sometimes dicrotous; the respirations are very hurried; the temperature rises suddenly at the onset, and there is very little difference between the morning and the evening readings. It rises very rapidly, from 98·4° to 105° or 106° in severe cases during second half of the first week, and often during the first two days of the attack. In mild cases the temperature, which has risen on the third or the fourth day to 105°, remains stationary till the eighth or tenth day, and after that period there is a decided remission, when the temperature slowly and steadily falls to the normal, or considerably below it. If a high temperature be maintained in the second or third week, or an unusual rise takes place, some inflammatory complication may be presumed to be present. The *fever* usually lasts for about fourteen days, increasing in a marked manner between the fourth and the seventh day, and continuing till the end of the attack.

Eruption.—The rash appears on the fourth or fifth, rarely as late as the seventh day of the fever. It consists at first of a few irregularly shaped spots, isolated or grouped together, of a dirty pink colour, disappearing on pressure, sometimes on a level with the surrounding skin, sometimes slightly raised above it. They may be either few and single and easily defined, or numerous and running together. They are about the same size, colour, and shape as the spots of measles. They first appear on the trunk, or on the back of the wrists, rarely on the back or face as in measles. They then spread to the arms and lower limbs. They are best seen on the trunk and arms. In a day or two they become of a brick-dust colour, or darker and more dingy in hue; they do not disappear, but only become paler on pressure. They have no defined margin, but merge into the colour of the surrounding skin. They are often converted into petechiæ. They never appear in successive crops, and many of the spots last until the end of the fever, and they often persist after death. In addition to the spots there is often a subcuticular rash, which imparts to the skin a marbled or mottled appearance. With the outbreak of the eruption the symptoms become aggravated, and the mind is more affected. Delirium supervenes, most frequently of a low and muttering kind, but sometimes noisy and violent. The danger increases with the amount of the eruption. In severe cases the remission usually observed between the seventh and tenth days does not take place. The frequency of the pulse corresponds with the elevation of temperature. It is often small and soft. In the beginning of the second week the eruptions become more livid in colour, the fever slightly increases.

The rise of *temperature* continues till about the end of the second week, when the temperature may reach to 108°; at this time there is great debility, great heat, and dryness of the skin, the tongue is dry and stiff, and the patient speaks as in a whisper. The signs of prostration become more and more marked, and nervous depression and stupor are the prominent symptoms. Between the twelfth and the twentieth day the tongue is often very dry and brown, or even black, and covered with sordes, and the patient cannot protrude it. Delirium and prostration increase; the patient cannot even turn in bed and is unable to raise a limb. There is great tremulousness of the hands, of the tongue, and of the muscles about the mouth. The features look extremely wasted and pinched; the breath is highly offensive, and has an ammoniacal odour. The stools are fetid, dark, and passed involuntarily. The patient lies listless, with eyes half closed and mouth open, and constantly slips down in bed; usually the pupils are contracted, and sometimes to a mere point—the *pin-hole pupil.* The urine is scanty and high-coloured, or suppressed; it contains a large quantity of urea, and chlorides are deficient; albumen may be present. The bowels are constipated, or there is more or less diarrhœa. Hæmorrhages from the mucous surfaces may take place. Other symptoms are profound somnolence, urgent and protracted hiccup, subsultus tendinum, and involuntary passage of urine and fæces, ending in coma vigil, uræmia, convulsions, and death. In *favorable* cases the crisis sets in, about the end of second week, or on the fourteenth day of the fever a change rapidly takes place, and all the symptoms abate perhaps in a single night, and a change from the hopeless condition for one towards recovery is established. It is ushered in either by diarrhœa or profuse sweating, or copious deposit of urea in the urine, or prolonged sleep, and there is gradual subsidence of pulse and temperature. There is also abatement of the nervous symptoms, the muscular power returns, the spleen is reduced in size, the eruption fades away, the tongue becomes clean, appetite improves, and natural sleep is restored. All these changes occur on or about the fourteenth day. The *delirium* is peculiar; it does not occur before the end of the first week, and is generally low and muttering, but occasionally violent and maniacal. Delirium is often a mere wandering for two or three minutes, and then the patient feels that he has been talking nonsense and recovers himself. It gradually passes into illusions and aberrations, until the patient falls into a very quiet and long sleep, from which he awakes free from delirium. The patients often retain an idiotic and stupid expression for several weeks, and they regain their bodily strength very slowly.

Complications.—Hypostatic congestion is common, as are also *bronchitis*, *pleurisy*, and *pneumonia.* In rare cases inflammation of the brain and its membranes occurs. Inflammatory swellings or buboes are common complications. Other complications, as gangrene of the extremities, and bedsores, are not uncommon.

Sequelæ.—In the debilitated condition which necessarily follows so severe a fever, the patient under unfavorable circumstances may become phthisical, but there are no special sequelæ of typhus. The sequelæ are supposed to be due to high fever, disturbance of respiration, and other causes at work during the attack. Some patients become extremely prostrated, and die consumed by fever. In others inflammation and suppuration of the parotid glands and pulmonary complications occur. In others again, suppurative changes take place and lead to intermuscular abscesses or abscesses in the connective tissue. The constant drain upon the system due to the existence of extensive bedsores is an obvious source of danger; the ichorous matter may become absorbed and lead to septic poisoning. Thrombosis of the femoral veins is occasionally observed.

Diagnosis.—The only diseases with which typhus fever is likely to be confounded are those others which begin with a single violent rigor, and typhoid fever. The differential diagnosis will be found under the head of typhoid fever. At the very beginning of typhus the absence of herpes, characteristic cough, sputa, and physical signs, will distinguish it from pneumonia. Pyæmia is usually connected with a discoverable source of infection in the body, and intermittent fever reveals its true character in a few hours.

Prognosis.—The rate of mortality under 20 is very low; the statistics of the London Fever Hospital show a mortality under 5 years of about 6·69 per cent., from 10 to 14 about 2·28 per cent., between 20 and 30 years it rises to 12·50 per cent., between 45 and 55 it amounts to about 50 per cent., and at 75 to 85 per cent. In a typical case convalescence begins about the thirteenth day. Death may occur from prostration or from pyrexia on any day up to the crisis, but after that it is usually due to some complication.

Treatment.—The disease being eminently contagious, the sick must be isolated from the healthy, the poison existing in the atmosphere about the patient, and in his clothes. The nursing should be very carefully attended to. The linen should be changed every day and the room freely ventilated. To check the epidemic the cause must be removed. To do this efficiently it is often necessary to pull down old houses and let the ground be thoroughly aerated. The poor must be fed and well housed, and have pure air; in houses 1250 cubic feet of space should be allowed for each inmate. Thorough cleansing and lime-washing of houses is essential; and clothes, bedding, and excretions should be disinfected or burned.

During the attack.—At the onset an emetic may be given and followed, if necessary, by a purge, as costiveness is apt to induce an increase of heat and affections of the head. Cold affusion may be then recommended. The delirium or coma may be relieved by constant application of cold to the head. The life of a patient with typhus fever is in the hands of his nurse. He must be constantly fed with small quantities of liquid, concentrated food, and stimulants must be given. Even in severe febrile cases stimulants are not contra-indicated, for under their use the pulse becomes less frequent and more equal, the countenance less anxious, the trembling of the hands also diminishes, and restlessness gives place to sleep. Alcohol may be withheld if there is severe headache, violent delirium, or strong pulse. It is essential that the patient be fed at intervals during the night, and it is a significant fact that death in cases of typhus takes place usually in the early morning. The chief indication of treatment is to check fever.

Bedsores should be prevented from forming by change of posture, air or water pillows, &c., and attention should always be directed to the bladder. Extreme pyrexia, as in typhoid fever, may be treated by cold baths, or cold and wet sheet packing continued for a long time. Hæmorrhages may be restrained by astringents. Sleeplessness and delirium are best treated by opium, to which, if there be great headache, a very dry and hot skin, and a strong pulse, antimony may be added with advantage. Chloral hydrate also is a useful hypnotic for these patients; should these fail, belladonna and bromide of potassium may be had recourse to. Pulmonary symptoms must be treated on general principles. If bedsores threaten in spite of the means adopted to prevent undue pressure, the parts should be kept very dry and painted twice daily with a mixture of collodion and castor-oil, or with a solution of gutta percha in chloroform (ʒj to ℥j). The treatment during convalescence consists in the careful administration of nourishment and tonics. A change of air is especially desirable.

TYPHOID FEVER (DOTHINENTERIA; GASTRIC FEVER; INFANTILE REMITTENT).

Typhoid fever (otherwise called enteric fever, and by the Germans abdominal typhus) literally signifies "like typhus," with which it was till recently confounded, owing to a certain resemblance between the symptoms of the two diseases, which are, however, entirely different in their nature. Infection with the poison of typhoid fever does not produce typhus, but always the same disease, and this fact shows that the poison is not alike in both cases. The prevalence or development of either disease under apparently similar causation, and the resemblance existing between some of the symptoms of each, have led to the belief in their relationship and the resemblance of their poisons. Unlike typhus, typhoid fever is not markedly contagious. The contagion is not very intense but the disease extends by contagion as well as by miasm. It is a kind of continued fever, characterised by the presence of rose-coloured spots chiefly on the abdomen, and tendency to diarrhœa with a definite intestinal lesion. The disease is endemic in many places, and often appears in an epidemic form. The germs of this poison are said to develop and multiply within the organism as well as outside it. The poison is contained in the dejections of the patient and is conveyed through the air, but more often through drinking-water, or milk. The chief sources of the poison are sewage, leaky drains, or cesspools.

Causes.—The emanations or effluvia from foul drains, or the contamination of drinking-water with the decomposing sewage matter, are its principal causes. Persons exposed to the emanations from the dejections are liable to become affected. The emanations from the skin and lungs do not produce the disease in the attendants. During the outbreak of this fever in London in 1876, milk was found to have been the vehicle for the distribution of the poison. The milk was supplied by a certain dairy in the country where the water used for cleaning milk-pails was found to be contaminated with the poison. Nurses are rarely infected with the poison unless they are exposed to the emanations from dejections. The miasmatic origin of the poison is known from its germs originating and increasing not only in the bodies of patients and their dejections but also outside of them. Typhoid fever occurs in places which are in want of proper sanitation. Under these circumstances the germs are either absorbed by the lungs or are swallowed with drinking-water. Evidence is conclusive on these points, but it is true, as has been urged against this theory, that workmen in sewers are not particularly prone to suffer from typhoid. The disease is most common in large towns, where the circumstances for the development and growth of these germs are extremely favorable, owing to the existence in the soil of large quantities of decomposed animal and putrid substances. In this respect the poison is akin to malaria, the production of which morbific agent varies with the rise and fall of water in the marshes. The development of the typhoid germ is due to the decomposition of animal substances and requires a certain degree of moisture for its production, in the same way as it is necessary for ague poison. The susceptibility to the poison of typhoid fever varies. The fact will be noticed when treating of ague, that persons who have lived long in malarious districts (without being attacked) are in less danger of the attack than those who have recently come to the place. The same holds good of typhoid fever. It attacks the rich and the poor alike, although the strong and well-nourished are more prone to it than the weak and badly-fed. It rarely attacks the same individual a second time. It is generally believed, and with some reason, that pregnant women and those who are suckling children enjoy almost absolute immunity from attack. Those suffering from acute or chronic diseases, from malignant disease, as cancer, and from heart-disease, are rarely attacked. It is a disease of the former rather than of the latter half of life. Infants and old people are rarely attacked; nearly half the cases occur between fifteen and twenty-five; both sexes are equally liable. When it occurs in infants it takes on a modified form and is then called infantile remittent fever.

Post-mortem appearances.—If death takes place early in the disease the body is not much emaciated. The rigor mortis is well marked, and there is extensive hypostatic congestion of the most dependent parts of the body. The abdomen of a patient who has died of typhoid fever is always distended. The blood is thick and dark-coloured; this change is owing to great perspiration and loss of water by profuse purging. It is poor in albumen and blood-corpuscles. The brain and spinal cord appear normal, although considerable functional derangements may have been noticed during life. The respiratory organs show structural changes. Typhoid ulcers in the larynx are of frequent occurrence. The lungs may exhibit some stage of pneumonia if that complication has been present, or they may be simply œdematous. Extensive catarrh of the smallest bronchi is frequently found. There may also exist hypostatic congestion of the lung, and there is often hepatisation of the lung-tissue, due to swelling of the alveolar walls. Occasionally the lungs are collapsed, and there is exudation in the pleural sac. The heart is pale, soft in texture, and occasionally much dilated. The liver and kidneys are swollen and soft. The spleen often attains an enormous size. Its substance is soft and friable, and the capsule tense. Most important changes are met with in the intestines, which are distended throughout and reddened in parts. A little lymph may be found on their surface, even if perforation has not taken place, if it has, there is usually a good deal of lymph and much adhesion. The mesenteric glands are enlarged and soft. These appearances, with of course considerable variety in relative degree, are common to all cases of typhoid fever. The mucous membrane of the ileum presents different changes depending upon the day of the fever at which death has occurred. The condition is divided into four stages, and which are graphically described by Rokitansky. First stage, or stage of congestion; second stage, of infiltration; third stage, of softening or breaking down, or stage of degeneration; and fourth stage, of ulceration.

First stage.—In this preliminary stage the mucous membrane of the small intestine is in a state of hyperæmia. The congestion is most marked in the lower part near the ileo-cæcal valve; the mucous membrane is swollen, soft, cloudy, and covered with mucus. The mesenteric glands are also swollen, soft, and vascular.

Second stage—Infiltration.—The mucous membrane is more swollen and of a deep red colour, especially near the solitary and Peyer's glands, in the lower part of the ileum. The glands and some portion of the membrane around them appear swollen and raised above the surrounding parts. The solitary glands are very prominent, and their surface corrugated. They feel hard to the touch, and are of a grey or yellowish-red colour. They present flat edges and are firmly adherent to the mucous coat. In size they vary from a pin's head to a pea; Peyer's patches are larger and they spread over a large area, and often coalesce, especially near the valve. They are elliptical in shape. These glands when cut into appear infiltrated with cellular elements and some soft medullary matter, known as medullary infiltration; occasionally the infiltration extends beyond the glands and affects the connective tissue. The mesenteric glands are also swollen and hard, and of a greyish colour.

Third stage—Softening.—It is a stage of commencing ulceration and various changes occur. In some cases the swelling of Peyer's patches and of the glands subsides and their contents become absorbed, the cellular elements having undergone fatty metamorphosis. In such cases the walls of the follicles and the mucous membrane covering them are not destroyed. In other cases the walls of the follicles and the mucous membrane are in a sloughy condition, and these sloughs generally correspond to the glands or the patches. Sometimes they are more limited in size. In other cases bursting of the glands occurs without sloughing, and the surface presents a reticulated appearance. The mesenteric glands are very much swollen and enlarged, some of them attaining the size of a pigeon's egg. When cut into they present a medullary appearance.

Fourth stage—Ulceration.—In this stage the sloughs formed over the patches and the solitary glands are shed, or are thrown off in masses, leaving ulcers behind. These ulcers are characteristic. Those over the solitary glands are rounded, those connected with Peyer's patches are oval or irregular in shape. Their size varies from that of a pin's head to a rupee. They are found in the lower part of the ileum. Those occupying the position of a Peyer's patch are seated opposite the insertion of the mesentery or on the unattached part of the bowel, which ought therefore in post-mortems in such cases to be carefully slit open along the mesenteric line. The long diameter of the elliptical ulcer extends in the long axis of the bowel, and never tends to encircle the whole inside of the intestine. Its edges overhang, so that they float up when water is poured into it.

The margins are of a slate colour and formed by the mucous membrane. The base is occupied by a yellow stained slough, distinguished from a piece of fæcal matter by the fact that it is not washed away by a gentle stream of water.

The ulcers vary in depth, and may rest upon the submucous tissue, the muscular layer, or even the peritoneal covering, or they may perforate the peritoneum. In this last case large quantities of fæcal matter are seldom found loose in the peritoneum, but a small quantity of fæces, closed in by adhesions and recent lymph, is usually found close to the point of perforation. When the opening is large, several pints of fæcal matter may be found in the peritoneum. The ulcers vary also in size; the largest are usually found near the ileo-cæcal valve.

The extent to which intestinal mischief occurs varies greatly. Sometimes only a few Peyer's and solitary glands are affected; sometimes the ileum is covered with ulcers, and they even extend to the valve. As a rule the large intestine is free from ulceration, but sometimes it exhibits large dysenteric sloughs, and sometimes there is continuous ulceration from one side to the other of the ileo-cæcal valve. More rarely the process extends to the jejunum and even to the pyloric end of the stomach. All these changes have been noticed in persons who have died of typhoid fever during the stage of ulceration. In those who have died during the third or fourth week, other structural changes have also been noticed. Such patients appear much emaciated, and there is marked anæmia. The rigor mortis is moderate, and the hypostatic congestion is less marked. Bedsores over the sacrum and trochanters are common. The bedsores may be mere abrasions of the skin or deep ulcers extending to the bones. There is occasionally swelling of one or both feet due to thrombosis of the femoral vein. There is sometimes suppuration of the parotids. On opening the body the abdominal, pectoral, and other muscles are seen to be pale and infiltrated. The blood is thin and watery, and there are often fibrinous blood-clots in the heart and great vessels. Some observers have noticed granular and waxy degeneration of the fibres of the heart and other muscles. The heart is flabby. The brain is pale and here and there presents red points. The splenic enlargement has diminished. Intestines: the ulcers exhibit indications of healing and cicatrisation. The cicatrices are depressed and often pigmented; they are smoother than the surrounding mucous membrane. Villi sometimes appear, but the glandular structure is not regenerated. In healing, the ulcers never cause any contraction of the gut, occasionally, instead of taking on a healing action, they extend and invade the vessels and cause intestinal hæmorrhage, or they may give rise to perforation. Throughout the intestines in the early stages of the disease the solitary glands may be enlarged, and they are sometimes ulcerated in the later stages. If death occur (probably from exhaustion) on the eve of convalescence, stains which represent the destroyed glandular tissue are found. If the patient die in the first week the Peyer's patches are very prominent, and their surface corrugated. The French speak of them as button-like, and the term aptly describes their great projection. If death have occurred near, but not after the twelfth day, this projection is not nearly so well marked, and commencing ulceration may be found on the corrugated surface of the Peyer's patch. After the twelfth day the typical typhoid ulcers are found, and the button-like appearance is no longer present. The typhoid ulcer occupies the position of a Peyer's patch. After death apparently due to diarrhœa the question may arise as to whether ulcers found in the small intestine are due to phthisis or to typhoid fever; if to the former, a group of minute tubercles will generally be found beneath the ulcer on the peritoneal surface of the intestine, but in the absence of any obvious morbid growth other points determine the question conclusively. Ulcers due to phthisis tend to encircle the intestine; they are transverse, while those of typhoid fever are longitudinal. The edges of tuberculous ulcers are thick and slope outwards, while those of typhoid ulcers overhang and are very thin. After burns ulcers, resembling in every particular of structure simple ulcers of the stomach, are sometimes found in the duodenum; but their locality and the stepped punched-out character of their walls distinguish them from typhoid ulcers. The sloughing of ulcers in dysentery, besides that it occurs in great patches and not in well-defined ulcers, is usually sufficiently distinguished from the typhoid lesion by being found in the large and not in the small intestine.

Symptoms.—A prodromal stage almost always precedes the invasion of this fever. Several days or even weeks may elapse before the active disease sets in. The symptoms are indefinite. They do not at first enable us to determine the true nature of this complaint. When the disease becomes established these prodromal symptoms confirm the diagnosis. Other acute infectious specific fevers often set in suddenly and without prodromal symptoms, but this kind of invasion is never met with in this fever. The incubation symptoms are insidious. The period varies from ten to fourteen or even to twenty-one days, during which time there is a general condition of malaise, the patient feels languid and uneasy, and experiences general fatigue and aching about the body, or pain in the limbs simulating rheumatic pains, and attends listlessly to his business. The mind is dull and the bowels are inclined to be loose, with pale stools. After these symptoms have lasted for a few days or weeks the true disease sets in. There occurs at first a chill. In this affection the chill is not so severe as in ague or pneumonia; there is usually no shaking of the body. Often there are several irregular chills. *During the first week,* though the symptoms increase in severity the patient may be disinclined to keep his bed. As a rule he feels extremely weak and prostrate, and is unable to take food. Has frontal headache, lassitude, with tendency to drowsiness by day and restlessness and wakefulness at night. He is dizzy on attempting to walk or rise up in bed. He often talks incoherently during sleep, and while awake he takes little interest in what goes on around him, and speaks only when spoken to. There is great thirst. The middle of the papillary surface of the tongue is covered with a thick layer of dirty white or yellowish fur, the tip and edges are florid. The tongue is seldom broad and marked by indentations of the teeth on its sides. As a rule it is narrow and pointed. The layer of fur soon falls off, leaving a red, smooth tongue with a tendency to dryness. The *breath* is offensive. The *abdomen* is swollen, tense and tender to the touch. If diarrhœa already exist, pressure in the right iliac region causes a gurgling sound. The ileo-cæcal region is also sensitive to pressure. There is also pain about the navel and in the epigastrium. There is increased dulness in the region of the *spleen.* This is chiefly noticed towards the end of the first week. It is difficult to trace the enlargement which is usually horizontal, for the organ is pressed backwards against the spinal column by the distended intestines. The *eruption* begins to appear about the end of the first week. It appears on the chest or abdomen in the form of rose-coloured papular scattered spots, about a line in diameter, circular, and slightly raised. These spots disappear completely on pressure and reappear when pressure is removed.

Fever.—There is a marked flush in each cheek towards the evening. At night the skin becomes hot and dry. The pulse is feeble, frequent, and sometimes dicrotous, about 98 to 110 or 112 in a minute. The dicrotous or double pulse is more frequent in this fever than in any other disease. It is due to a sub-paralytic condition of the contractile elements of the coats of the arteries. The blood-wave is quite large, but the artery remains soft during the diastole, and hence the first pulsation is followed by a second weaker one. The frequency of the pulse is not in proportion to the temperature. Any excitement of the body or mind increases the frequency of the pulse. The *temperature* is often 104° or 105° during the first week, and it is generally characteristic even though the pulse indicates little deviation from health. The evening temperature is nearly two degrees higher than that of the morning, and this characteristic is retained for the first few days. The next morning it is one degree less than the preceding evening. At the end of the first week there is no increase in the evening temperature, but the morning temperature is still characteristically less than the evening.

Vomiting is a frequent symptom. The bowels are sometimes costive at first, but usually there is diarrhœa. The pulpy and fluid stools generally appear at the end of the first week. The evacuations are unattended with any pain. The diarrhœa, though sometimes absent, is often a most characteristic symptom of the onset of the disease. There is disinclination to sit up, and change of posture gives no relief. There is often bleeding from the nose with relief to the headache. Very often there is cough with mucous sputa (bronchial catarrh). Various other changes are noticed. The *appearance* becomes haggard, pale, and sad. The eyes become sunken, though bright at first. *Urine* is acid, high-coloured, sometimes scanty, as in other fevers, with copious exudation and high temperature. There is excess of urea and uric acid owing to increased metamorphosis of tissues, and a trace of albumen, but great diminution of the chlorides. Retention of urine now and then occurs. The decrease of chlorides may be due to the blood retaining more salts owing to its being deficient in albumen, or to diminished ingestion of salt with food, or to its increased excretion by the bowels.

As the case advances, and during the end of the first or *beginning of the second week,* the pains in the head and limbs cease. Weakness is increased. The oral and pharyngeal catarrh increases, and extending through the Eustachian tube causes deafness. Dizziness and noises in the ears continue, and are even more severe than at the commencement. The disturbance of innervation is most marked. There is depression of spirits, confusion of intellect, apathy almost bordering on stupidity, a state of somnolence from which the patient can be roused only with difficulty. If asked to protrude the tongue he does it with difficulty, or after being repeatedly persuaded to do so, and when once protruded he forgets to draw it back until again urged to do so. There is sometimes active delirium. The control over urine and fæces is defective, often the excreta are passed in bed. The posture indicates unconsciousness. He lies on his back or on his side for any length of time. If turned from one position to another the limbs move involuntarily and assume a dependent position, even though it may be very uncomfortable. The delirium is peculiar, the patient talks incoherently, often tries to get out of bed, gesticulates violently, especially if restrained. The mind wanders from one subject to another or is fixed on some particular object. All these active symptoms are aggravated and are most marked at night. The patient lies generally with his mouth open, and the interior of the mouth is hot and dry, as is the surface of the body generally. Thirst continues, the tongue may continue furred and white, but generally there is a central streak, and the tongue is brown, dry, and fissured, and there is a mere trace of fur round the central streak, very often it is cracked, red, and glazed. There is increased tenderness over the abdomen. The splenic enlargement continues.

Bowels.—In some cases constipation exists even during the second week, but as a rule diarrhœa is a prominent symptom at this time. The intestinal symptoms become well developed, the belly is much enlarged and puffed. There is increased pain, and gurgling in the right iliac fossa; from three to ten or more watery stools being passed in twenty-four hours. The diarrhœa is due to the intestinal catarrh and not to the existence of ulceration. The stools are alkaline, of a pea-soup colour, and contain traces of albumen. They often contain shreds of lymph, and sometimes blood mixed with remains of food, detritus, and epithelium.

Respiration.—The breathing is hurried; in a few cases there is cough with mucous expectoration. Occasionally the breathing is irregular, noisy, and blowing or hissing.

Countenance.—There is some amount of lividity about the lips and cheeks. The patient lies with his eyelids half closed, the conjunctivæ appear injected and hazy. There are sordes about the teeth and gums. The lips and tongue are parched, fissured, red or brown, and dry, and covered with a blackish crust. The breath is more offensive.

Eruptions.—These appear in successive crops, each lasting for three or four days, and their whole duration varying from seven to twenty-one days. They often become numerous, and spread from the abdomen to other parts. Sudamina frequently appear on the neck, chest, abdomen, and in the groins. In 10 or 12 per cent. of cases the fever runs its course without any rash or eruption. The spots are sometimes found on the trunk only.

Fever.—The temperature remains high, 104° to 106° in the evening, with a remission in the morning. The skin is dry, but in most cases dryness alternates with perspiration. The pulse reaches 110 or 120 in a minute, but its frequency varies greatly on different days and at different hours of the same day. As a general rule it rises in the evening and falls in the morning.

Urine.—This is often passed involuntarily, and contains traces of albumen.

In the *third week* the patient is extremely weak and prostrate, and emaciation is great. He lies in bed in one position unable to sit up. The limbs move involuntarily and remain in the most dependent position. In severe cases the nervous derangement is most marked. There is mental confusion, delirium, hiccough, and extreme prostration. In some cases delirium passes into a state of stupor. There are often tremors with subsultus tendinum. The subsultus is due to extreme prostration. The somnolence and stupor become extreme. The patient often picks at the bed-clothes, and there is involuntary passage of urine and fæces; occasionally there is retention due to the paralysis of the bladder.

Bowels.—Owing to the general congestion of the mucous membrane, or to the ulceration of the bowels opening into the blood-vessels, hæmorrhage occurs. This in rare cases, and when due to congestion only, is salutary, and the patient, after hæmorrhage, commences to recover.

Respiration.—The frequency of breathing and other chest-symptoms, as cough, attended with mucous expectoration, and the physical signs of dulness in the back, the rhonchi and mucous râles become more decided.

Countenance.—The face is pinched, eyes sunken, deafness is more marked, and there is great emaciation. The breath is more fetid, the sordes more marked; the tongue is covered with a dark brown thick crust. The speech is unintelligible.

Eruptions.—The roseolous spots begin to grow pale, and are rare after the thirtieth day.

Bedsores are extremely common. They often threaten to occur at the commencement of the third week.

Terminations.—In unfavorable cases death occurs generally towards the end of the third week. Ulcers in the ileum and cæcum may perforate and cause death by peritonitis or by collapse. Death is also due to extreme prostration or weakness. A permanent and persistent high temperature of 104°, or an absence of the morning remissions, is a very serious symptom. Fatal cases also result from œdema of the lungs, the breathing becomes frequent and superficial, and paralysis of the heart ends the scene.

Favorable symptoms.—In favorable cases the subsidence of the symptoms usually commences in the middle of the third or course of the fourth week. On awaking from sleep the patient feels refreshed, the mind becomes clear. The posture of the patient is now changed, he voluntarily turns from the back to the side, in order to avoid pain and distress. He now passes urine and fæces voluntarily, the breathing improves and cough abates, the expectoration becomes easy, and the mucus is less tough and yellowish. The frequency of stools is diminished, and the matters passed are less liquid. The countenance loses the bluish appearance and becomes pale. The tongue improves, the dryness gives way to a moist condition, the fur is diminished, and the cracks disappear. Physical examination of the chest reveals abatement of the chest symptoms. The respiratory sounds become more distinct, the mucous and other râles disappear. The fever slowly subsides, the pulse becomes less frequent, fuller, and loses its dicrotous character. The temperature chart shows a marked difference between the morning and the evening temperature. The morning temperature is reduced to 101° or 102°, while that of the evening still ranges from 104° to 105°. Where the recovery is slow and tedious it shows that the intestinal ulcers still exist. In such cases the improvement may be temporary, and the patient may eventually die from perforation leading to peritonitis, or from collapse or suffocation. Relapses sometimes occur.

In cases seen in Bombay the symptoms generally described are not invariably present. We meet with numerous and varied deviations, and the most important of these are worth noticing. There are cases which during the first week present symptoms peculiar to the disease, but less violent than usual. During the second or the third week these abate or even disappear. Thus with some the tongue continues moist, and there is no eruption, no delirium, and the patient is scarcely confined to bed. In others there are no other symptoms except gastric derangements, and the bowels are constipated or irregular; such abortive cases were known as gastric fever or abortive typhoid. In these cases on the eighth or ninth day of the disease the temperature no longer rises, but gradually falls. There are decided morning remissions. In others the symptoms persist from twenty-one to thirty days. With them the diminution of the temperature and pulse is extremely slow but gradual, and relapses occur. Again, in some cases the pulse is only 96, but the temperature 104° ; the tongue may be moist, with heat and flushing of face and slight headache. There are irregular chills, with loss of appetite, disturbed sleep, and aching of the whole body and listlessness ; there may be constipation or irregular bowels or diarrhœa. Every epidemic, as Sydenham long ago remarked, has its own characters.

Complications.—Various affections of the respiratory organs, as laryngitis, bronchitis, pneumonia, and pleurisy are not unfrequent. Epistaxis occurs so frequently that it may be regarded as one of the ordinary symptoms of typhoid. It is sometimes so profuse as to cause death. Intestinal hæmorrhage and perforation of the intestines are the most important and dangerous complications of typhoid fever. The most profuse hæmorrhage usually takes place during the third week, and is due to a small artery having been laid open by the ulceration. Hæmorrhage occurring after the twelfth day is a serious symptom. Perforation of the intestines leads to general peritonitis. Where the perforation is small adhesion may take place between the loops of intestines, and little or no escape of the contents may occur. Recovery has been known to take place after perforation of the bowel, but such a result is very rare. Intestinal hæmorrhage, if profuse, leads to sudden collapse, the temperature falls, and occasionally the mind becomes clear. Where the hæmorrhage is less profuse the patient dies with symptoms of gradual exhaustion. Extensive hæmorrhage has been known to take place into the bowel, and the patient die before any blood has been passed. The symptoms are those of profuse hæmorrhage in general, viz. great prostration, pallor of the surface, fall of the temperature, with increased frequency of pulse.

Sequelæ.—The most remarkable sequel of typhoid fever is paraplegia, which may be so complete as not to differ in any symptom from the result of spinal injury. It, however, always gets well. Otorrhœa and other slight sequelæ are associated with the condition of debility, and there is sometimes a prolonged dyspepsia. Suppuration of the lymphatic glands in the neck and axilla, chronic pneumonia, bronchitis, and pleurisy, pyæmia due to absorption of ichor from bedsores, anasarca and catarrh of the bladder are sometimes observed to follow an attack of typhoid fever. The retarded healing of the intestinal ulcers leads to an extremely slow recovery and is accompanied by symptoms of low fever. In such cases bed-sores are especially liable to occur; emaciation is excessive, and there is often œdema of the lower limbs, or only of one leg, from thrombosis of the femoral vein.

Duration.—In favorable cases typhoid fever lasts from twenty-one to thirty days, but it may be prolonged to beyond the fortieth day. Relapses are very common. The disease may terminate in death or recovery at a comparatively early date. Thus, slight attacks often end in recovery in a fortnight or less, and in severe cases the course is occasionally very rapid and death takes place in the first week.

Diagnosis.—Typhus and typhoid fever were long confounded, and were ultimately separated by the discovery of the characteristic intestinal lesion in typhoid. In the post-mortem room the distinction is now easy, but at the bedside cases are often seen in which it is difficult for a time, or even throughout the disease, to ascertain under which head they ought to be placed. The chief differences in the symptoms are:

1. *Age.*—Typhoid is a disease most common in youth and adolescence. More than half the cases of typhus are over twenty-five years of age.

2. *Prostration.*—In typhoid the prostration is seldom extreme till the second week. In typhus, prostration sets in about the fourth day, or earlier.

3. *Face.*—In typhoid the face is bright and has a hectic flush on the cheeks. In typhus the face is dusky.

4. *Diarrhœa.*—In typhoid, diarrhœa and hæmorrhages are common.

5. *Hæmorrhage.*—In typhus is seldom or never witnessed.

6. *Attack.*—In typhoid the onset is gradual, the rigors numerous. In typhus the onset is sudden, and there may be but one rigor.

7. *Eruption.*—In typhoid the rash appears on the seventh day, and first on the abdomen or chest; in typhus it appears on the fifth day, and on the back of the hands. In typhoid the rash consists of successive crops of a few small, isolated, rose-coloured, circular spots. In typhus the rash is composed of numerous spots of irregular form, varying in diameter from three or four lines to a mere speck, and either isolated or grouped together in irregular patches. It appears but once, is persistent, dirty-pink at first and

gradually darkens. The spots are accompanied by a less defined subcuticular mottling.

8. *Temperature.*—Typhoid fever is characterised by a peculiarly gradual rise in temperature; in typhus the temperature often reaches a very high point within the first twenty-four hours.

9. *Delirium.*—In typhoid the delirium is active, the patient tries to get out of bed; in typhus it is generally a low muttering delirium.

10. *Pupils.*—In typhoid the pupils are usually dilated; in typhus they are mostly contracted. In the former, there is usually anæmia, and in the latter, hyperæmia of the eye.

11. *Duration.*—In typhoid the duration is three weeks, in typhus about two weeks.

12. *Crisis.*—Typhus generally ends in crisis. In typhoid the termination is gradual and is liable to be interrupted by complications and relapses.

13. *Death.*—In typhoid death is by exhaustion or asthenia, in typhus it is more commonly by asthenia or coma. The terms brain fever, gastric fever, enteric fever, point to the development of symptoms in the direction of the organ named, in addition to, or so far as to obscure, the more common course of typhoid fever. Brain fever, however, is a term which has been very loosely used; it is the favourite resort of novelists, and in popular language includes not only typhus, but any delirious condition of more than very short duration.

Remittent fever sometimes closely resembles typhoid. The eruption peculiar to the latter affection is the only distinctive mark Pyæmia may closely simulate typhoid fever, but can generally be distinguished from it by the absence of the rash, the yellow tinge of the skin and the profuse sweatings. Several tubercular diseases present symptoms coinciding very closely with those of typhoid. Tubercular meningitis and acute tuberculosis of the lungs may be mistaken for enteric fever. The presence of the rash and the enlargement of the spleen would be evidence of typhoid, but the absence of these symptoms does not prove the contrary. A carefully kept register of the temperature will assist in establishing the nature of the complaint. It is also especially to be remembered that in typhoid fever the abdomen is distended and tympanitic, whereas in tubercular disease it is usually retracted. Pneumonia with typhoid symptoms, is sometimes mistaken for typhoid fever. The diagnosis is, however, generally easy.

Prognosis.—The mortality is about sixteen per cent. In favourable cases the fall of the temperature is slow, the diarrhœa and other unfavourable symptoms gradually abate. In unfavourable cases a presentiment of death is often felt by the patient, and the temperature is high (often 105° from the beginning), and sustained so till a late period; great fluctuations are often observed. The diarrhœa is persistent. There is great prostration, continuous delirium, with twitching and jactitations, hæmorrhage from the bowels, and cerebral and pulmonary complications. Very severe cases of this kind however, may recover if perforation does not occur.

Treatment.—Prevention.—Outbreaks of typhoid fever can be prevented only by constant attention to drainage. In large cities, great care is necessary that decomposing vegetable and animal matters do not remain in proximity to human habitations. Under proper and effectual drainage the number of fever cases may be greatly diminished. The cause of a bad smell ought never to be left undiscovered for a day. Drains should be ventilated, and should, as far as possible, be built outside the houses. There should be a proper fall for the drainage, and the water-supply should be so arranged as to run no risk of contamination from sewage. When an epidemic has occurred, all drains and wells, suspected or unsuspected, should be thoroughly investigated. In all public buildings and groups of buildings distinct plans of the system of drainage should be preserved. It ought never to be assumed that leakage has not occurred till the sewer has been thoroughly examined. Sewer gas escapes through very small openings, and these may be caused in all kinds of unsuspected ways. Another source of typhoid fever, which the physician should always have in his mind, is the existence under buildings of disused and forgotten cesspools. Sewer gases, bad drinking-water and milk are the usual sources of infection. The disease being, to some extent, contagious, the sick should be isolated from the healthy, and only those required to nurse him should be allowed to be near the bed. When an epidemic has occurred, those members of the family who have escaped infection should be removed to another and distant locality. As the disease is chiefly communicated through dejections, the privies should be carefully disinfected and the excreta from the patient should be burnt, or buried in the earth with quick-lime or carbolic acid, or solution of chloride of zinc. If the disease has once set in, attempts may be made to cut short its course. Calomel in one or two five-grain doses has been tried during the first week and before diarrhœa has set in, and has been found in a few cases to cut short the disease or to render its course milder. Small and repeated doses of the compound tincture of iodine, from three to four minims, have been recommended as a specific, and especially for the purpose of destroying the putridity of the excreta. It is also said to have a decided effect in reducing the temperature and lessening fever. In every case attention to hygiene is of first importance. The room should not be overcrowded, and free ventilation must be provided for. The temperature of the room should not exceed 60° or 65°. The bed-clothes and the body-linen should be frequently changed. The patient's body should be kept scrupulously clean, care must be taken to prevent any traces of urine or excretions from the bowels from remaining on his skin around the anus or the genitals. Owing to neglect of these precautions erythema is apt to appear, and may lead to bed-sores. The mouth and teeth should be carefully cleansed with a brush or a piece of rag dipped in water, to which some Condy's fluid and tincture of myrrh have been added. Where owing to extreme debility or prostration, or the state of stupor, the patient is unable to sit up in bed or to attend to his daily ablutions himself, the nurse or the attendants must do their best to keep him perfectly clean. The chief indications in the treatment of typhoid are, 1, to reduce the temperature, 2, to moderate diarrhœa, and 3, to keep up the strength by nourishing diet. The first essential in typhoid fever is that the patient should remain in bed. It is much better to use a bed-pan from the very beginning than to defer using it until the patient is too weak to leave his bed. Violent hæmorrhage, aggravation of inflammation, and perforation are often produced by the patient walking across his room, or even using a night stool close to his bed.

Patients sometimes ask for an emetic, because of the slimy taste in the mouth. It should not be given, however, as it always has an injurious effect on the course of the disease. If at the beginning of the disease the bowels are confined, one dose of castor oil may be given. Saline purgatives are to be avoided, as they are liable to induce severe diarrhœa which is often difficult to check. After this the known condition of the intestines will prevent the physician from trying to check the diarrhœa, unless the stools are very often repeated. In this case opium may usually be relied on. If the abdomen is tender, a large, thick, linseed poultice should be placed upon it. In cases of extreme tympanitis the old treatment was to put on a blister. This will relieve the distension, but may cause a slough, and is, therefore to be used with caution. Occasionally violent vomiting occurs. Solid opium is the best remedy.

To check fever, the patient should be allowed to drink ice- and soda-water to replace the loss of water by perspiration. Food should be given repeatedly and in a liquid form, so that it may be readily digested; meat-broths, eggs, and milk may be given in small quantities and frequently. This rule about the diet is all-important in typhoid fever. The physician saves most cases who is most particular about it. Every detail ought to be written down. Beef tea and milk will form the best and safest diet for the first three weeks. The chief reason for the necessity of so much care arises from the fact that in this, as in other fevers, there is great consumption of the tissues of the body, and that to replace this waste the supply of materials from without is necessary. In this fever the increase of bodily temperature to above 102° or 104° for several days shows that the consumption of tissues is considerably augmented. During convalescence the patients appear extremely emaciated and have lost much in weight. As a rule recovery among these fever patients is extremely slow, and there is clear evidence that the powers of reparation are at an extremely low ebb. In every case caution is necessary in selecting as well as in administering food. Generally in fever patients there are signs of disordered digestion, and these are more prominent in typhoid than in any other fever.

Medicines.—In mild cases we need no medicine. As a palliative some recommend ʒj of chlorine water in a glass of camphor-mixture every three or four hours ; others give dilute nitro-hydrochloric acid in doses of from ten to fifteen minims three times a day. In cases where there is threatening danger energetic treatment becomes necessary. The greatest danger is from consumption of the body by fever which is generally more intense in this than in any other infectious disease. Besides the danger from consumption there is another evil resulting from the rise in temperature. The continued increase of the production of heat leads to paralysis of the heart, and this, with the increased transformation of tissues, if not energetically combated, leads to death in a short time. When the temperature is very high, say 105° or 107°, and the pulse very frequent and fluttering, and there is low muttering delirium with insensibility, baths frequently give relief. The bath should be of 95° at first, and *gradually* while the patient is in, lowered to 65°. He should be kept in the bath for about twenty minutes, or till he feels slight shivering, and then removed at once to bed and covered up with blankets. By this treatment the patient finds relief and the temperature is lowered. There is retardation of the pulse, and the mind becomes clear, the exhaustion passes off, and recovery follows, although a slight reaction may come on after a time. Most cases in Bombay so treated have recovered better than under any other treatment. In these and similar cases baths should be used with extreme caution. Cold sheets and cold baths undoubtedly lower the temperature, but increase the production of heat, and often lead to exhaustion. The treatment suggested above is, however, a very successful one inasmuch as it lowers the temperature very slowly by about 2° or more, and it is less dangerous than *sudden* abstraction of heat by cold baths or cold sheets. Where the temperature rises to about 104° the patient should be put in the bath every three or four hours. The next best treatment to check fever is the administration of quinine. It may be given in two or three grain-doses every four hours. Digitalis is by some preferred to quinine. It is given in fifteen or twenty minim doses of the tincture every three or four hours. Under its use the temperature begins to fall and the frequency of the pulse becomes less.

There are often other urgent symptoms which claim our most serious attention. The catarrh of the air passages and congestion and collapse of the lungs are very dangerous and very difficult to treat.

Hæmorrhage.—Turpentine in five to ten drop doses and frequently repeated checks hæmorrhage. Hæmorrhage from the bowels in the first week need excite little alarm, and it is usually a sign for increased quietude. Cold compresses to the abdomen give relief. If it continue, opium and nitrate of bismuth in ten-grain doses, or alum, are the remedies. Ergot, either given internally or hypodermically injected is another efficient remedy. In tympanitis evacuation of the gas by means of a stomach-pump tube passed up the anus gives relief. Some recommend turpentine in ʒss doses and enemata of starch and opium. Ten or twelve drops of laudanum with starch is often a successful injection for the relief of tenesmus. It should be borne in mind that fatal cases are on record due to lead contained as an impurity in nitrate of bismuth. Filling the rectum with ice has been tried with some success in the hæmorrhage which may occur in the third week or after, but such cases usually prove fatal. Hæmorrhage from the nose may be checked by a tampon applied early.

Diarrhœa.—For the diarrhœa when profuse, give astringents; of these the best prescription is the following:—Mist. Cretæ. ℥vj, Tinct. Catechu Co. ʒij, Extr. Hæmatoxyli ℈ij, Tinct. Opii ʒss, mix; one fourth part to be taken every three or four hours. Some recommend alum gr. x or tannin gr. x with opium gr. j made into a mixture. In perforation of the intestine, opium in grain doses given every hour should be tried. Whenever retention of urine, due to paralysis of the bladder, has been noticed, the bladder should be evacuated every morning and evening by means of the catheter.

Bed sores.—If recent the local application of brandy or of lead lotion several times a day will suffice. If the sores be deep they should be treated with nitrate of silver. If pneumonia arise as a complication, a poultice may be put on the back which is the region of the lung most often affected, but beyond an increase of stimulant, no other treatment is called for. In bronchitis wet or dry cuppings, sinapisms, or blisters to the chest are highly useful, and internally, senega mixture with ipecacuanha wine. If the expectoration is arrested give an emetic. Diet is all-important in typhoid fever. Beef tea and milk will form its ingredients for the first three weeks. After that more solid food, beginning with eggs may be slowly and cautiously given. The least indiscretion in diet may set up inflammation in the ulcerated bowel ending in perforation and death. Vegetables are to be avoided. If vomiting occurs in convalescence it is an indication for a little carefully prepared solid meat. Some physicians give eggs at any stage, and where, as in India, one can be sure that the eggs are perfectly fresh, this may be done safely. Milk disagrees with some patients, and to these freshly-made sweet whey may be given. Some cases need no stimulant, but in most a moderate quantity of wine is useful, and where there is a tendency to collapse, wine and even brandy must be given till the tendency is counteracted. Persons already debilitated at the commencement of the attack require large quantities of the stimulant, and for them brandy is best. Sea bathing with change of air is the best treatment for the paralysis which occurs after typhoid fever.

Relapsing Fever. Recurrent Fever.

It is otherwise known as the famine fever. The disease never appears sporadically. It is a contagious miasmatic disorder, the infection is contained chiefly in the emanations from the skin and breath of those affected. This fever lately appeared in Bombay, into which place it was imported from the famine districts of the Deccan and Madras. Like typhus it is a continued fever of short duration, with bilious symptoms superadded. Like it also relapsing fever is highly contagious, but, unlike typhus, patients who have once suffered from this disease enjoy no immunity from similar attacks. It originates from fatigue, over-crowding, unusual and excessive want and destitution. The disease is readily diffused under conditions of defective sanitation or want of personal cleanliness. It soon abates when the circumstances under which it originates (famine, &c.) are changed for the better. In epidemics the indigent suffer, and the upper and middle classes, as a general rule, escape, but persons living in comfortable circumstances, and in localities where the disease is unknown, are often attacked on visiting infected persons. In the Bombay epidemic males suffered more than females. Season or climatic condition appears to influence its development and extension. It is most prevalent in India at that period of the year when malaria is comparatively absent.

Pathology.—The infecting substance or the poison is developed within the body of a patient as well as outside it. It is carried by the atmosphere and by fomites. It is generally destroyed by dilution, and therefore without prolonged exposure strong persons are rarely affected. There can be no doubt that the disease is spread by a specific contagion given off in the cutaneous and the respiratory exhalations. It is not as yet generally admitted that during famine the poison is engendered within the body. Some imagine the poison already existing, and believe it to be innocuous except when the frame is rendered low by famine or destitution. During the epidemic in Bombay, 1877-8, several persons were known to be attacked with the fever two or three times at short intervals. Observations made by Dr. H. V. Carter show that the poison is readily transmissible by inoculation. A few years ago (1873) Dr. Obermeier, of Berlin, published an account of certain mobile filaments discovered by him in the blood of living persons suffering from relapsing fever. These filaments correspond in thickness to the finest filaments of fibrin, and have a length varying from $\frac{1}{3000}$th to $\frac{1}{700}$th of an inch. As long as the blood remains fresh they exhibit undulatory movements, and also spiral contractions followed by elongation, in virtue of which they seem to have the power of locomotion, and to travel across the field of vision. These filaments were to be found only during the febrile paroxysms, they were absent in the intermission as well as shortly before and during the crises. The organisms have been noticed by other observers, and named the *spirillum Obermeieri.* They have, however, been found in the blood and other secretions of persons free from any symptom of relapsing fever, and the prevailing opinion now is that their presence in this complaint is by no means an essential phenomenon.

Post-mortem appearances.—Various pathological changes have been observed in different organs and especially in the spleen, liver, and kidneys; these changes refer to derangement of circulation and nutrition. In relapsing fever, the rigor mortis sets in early and continues long. The skin generally is yellowish and there is marked hypostatic congestion, the muscles show signs of degeneration, they appear cloudy, indistinctly striated, and filled with granular matter. This condition accounts for the severe pain felt over all the muscles of the body during life. The blood is dark-coloured, often watery and without any tendency to coagulate. The brain and its membranes present various changes, dependent upon the period at which death has occurred. The lungs appear congested and in some cases there are hæmorrhagic infarctions. The heart is pale, flabby, and friable. The liver is enlarged and often nodulated; on section, sometimes waxlike spots are observed on its surface. The spleen is also enlarged and generally firm and friable, but sometimes very soft and pulpy. The Malpighian bodies project and are prominently marked; and here and there small yellowish white cavities containing pus are found; these are supposed to be cavernous venous meshes of the spleen which have undergone inflammation and suppurative changes. The kidneys are also enlarged and the epithelium of the uriniferous tubes is swollen and often filled with granular matter. In a few cases renal abscesses are found.

Symptoms.—The period of incubation or of infection commences from five to fifteen days before the onset of the fever. It is in relation with the intensity of the invasion stage. In some cases the fever is developed directly after exposure and the prodromata are wanting. In another class of cases the patient feels weak and ill for some days before the attack. There is disturbance of general health and pain in the extremities; the countenance is dull and dusky. The gums and conjunctivæ are anæmic and of a dirty colour; the digestion is impaired, and the tongue moist and thickly coated. The invasion sets in with chilliness or a violent rigor, headache, severe pains in the neck, back, and limbs, and a feeling of great prostration. The cold stage is followed by dry burning skin, increase of the pain, and great thirst. The patient is seldom delirious, in spite of the intensity of the fever. On the second or third day sweating may occur, but the symptoms are not relieved thereby, and the sweating is not always observed. The skin continues hot and dry, there is great thirst, the appetite is lost, the tongue is broad and coated with a yellowish fur, but moist all over and red at the tip and edges, thus differing from the small pointed and dry tongue of typhoid fever. The bowels are usually constipated and there is often bilious vomiting. The pain in the head, giddiness, and severe muscular pains in the limbs continue. There is also pain and tenderness in the region of the liver and spleen, which are also enlarged, and there is sometimes jaundice owing to catarrh of the duct. As a result of the high temperature the urine often contains albumen, blood-corpuscles and epithelium; it is generally scanty and may be suppressed, as in parenchymatous nephritis. The fever generally exacerbates towards evening and abates in the morning. The temperature rises during the chill and may afterwards reach 105° or 107° F. The pulse is more frequent than in any other fever. It is in every case above 110, and is hard at first, but soon becomes soft and dicrotous. There is no ratio between the pulse and the temperature. The respirations are hurried, and as numerous as 40 or 50 in a minute. The paroxysm continues from three to five or seven days, when a sudden change takes place, the dryness of the skin is exchanged for perspiration of a faintly acid and mousy odour, and there may be bleeding from the nose. All the febrile symptoms are now apparently relieved; the body temperature is reduced to 99° or less; this is owing to excessive loss of warmth, due to evaporation of the perspiration. Very often at night all the symptoms become aggravated. The patient suffers from violent delirium, frightful dreams, and sleeplessness. In exceptional cases eruptions or spots of a pink colour appear on the chest, legs, and abdomen. They are roseolar in character, and are sometimes replaced by a reddish mottling, disappearing on pressure, and never becoming petechial, and fading after a few hours or a few days. During this eruptive stage the temperature is seldom above 101°. In some cases the hot stage or the eruptive stage [is soon followed by a crisis, during which there is bleeding from the nose or a profuse sweat or desquamation from the skin. With the crisis there is reduction of temperature to 98° or even 95° F. The pulse is also reduced to 75 or 80. Headache disappears, and with it the pain in the joints. In some of these cases there is danger of death from collapse. The patient is extremely prostrate, is much reduced in flesh, and the conjunctivæ appear yellowish. In rare cases, where the urine is suppressed, stupor, coma, or even convulsions supervene.

In relapsing fever, as in typhoid fever, the temperature shows a morning remission of one or two degrees. It often increases after the second day to 107°. These high temperatures, characteristic of this fever, do not indicate danger. At the crisis there is a very rapid fall of from 5° to 6° or even 9° F. in a few hours. For two or three days after the crisis the temperature may be as low as 96°, or even 94°.

Relapse.—In a few days, usually after apparent convalescence has been established, or in about six or eight days, or at most fourteen, suddenly a relapse or a second attack occurs, which assumes the form of a smart but brief reaction. In it the fever is severe; it is sometimes accompanied with parenchymatous inflammation of internal organs, and may lead to death. Ordinary cases begin with a chill; other symptoms are less pronounced and more mild than the former febrile symptoms. The fever continues for two or three days, or at most five days, during which the pyrexia may be either paroxysmal or of a remittent type. The muscular pain is milder, but the liver and spleen again swell. The disease ends abruptly with a crisis. The second attack is usually short, and lasts only for three or four days. There may be a third or a fourth relapse. Generally, however, after the second the patient is gradually restored to perfect health, and the disease terminates.

Temperature.—On the day the fever relapses the temperature rises very promptly to 103° or 104°; the remissions vary from 1° to 3° F. After the relapse has continued from three to five days the decline sets in; there is profuse sweating, and the temperature rapidly falls to 98°, or even as low as 95°.

Relapsing fever somewhat resembles ague, but in the latter antiperiodics succeed, which have no effect in the relapsing fever. In this fever the prodromata are often wanting. The chill is well marked. There is perspiration alternating with heat of skin, which is seldom the case in the malarial type. The temperature fluctuations are slight and irregular. In relapsing fever the onset and the decline are characterised by suddenness.

According to Dr. Obermeier the first paroxysms always, and relapses frequently, are marked by the presence in the blood of spirillum. In ague fever the parasites are never present. In ague there is no sudden fall, as in the recurrent variety. The most diagnostic features are the crises which occur from the fifth to the seventh day, and the relapse, which generally takes place on the fourteenth day of fever. From typhoid it is distinguished by the sudden onset, the sudden decline, the rise of temperature after the second day to 108°, and its persistence with remissions varying from 1° to 3° for five or six days, and then a sudden fall to 98° or 95°. The absence of the characteristic typhoid eruption, the presence often of violent and protracted jaundice, severe muscular pains in the neck and limbs, and the diagnostic features of crises and relapse also serve to exclude typhoid fever.

Terminations.—There may be two or three or even four relapses, ultimately ending in recovery, but leaving the patient anæmic for five or six weeks. Occasionally the patient passes suddenly into a state of collapse, or death may take place from asthenia, or from coma, or from cerebral complications, or from sequelæ, as pneumonia, or may be due to the previously exhausted condition of the patient. But death occurs in only about 3 per cent. of cases. In India the mortality is from 5 to 10 per cent.

Complications.—The chief are pneumonia, diarrhœa, dysentery, and ophthalmia. Pregnant females suffering from this fever generally abort. Rheumatic affections of joints, affections of lungs, and suppuration of lymphatic glands in the neck, axillæ, or groins, are most common. Hæmorrhages from the nose, uterus, stomach, and bowels are also noticed most frequently at the crisis. The ophthalmia which sometimes sets in during convalescence is a remarkable feature of this disease. The affection appears to consist of inflammation of the choroid and vitreous body. The symptoms are those of amaurosis. Recovery is the usual termination, but is very tedious.

Treatment.—Prophylaxis consists in improving the condition of those among whom the disease is likely to spread. When an epidemic has broken out, a due supply of the necessaries of life to those in want, careful attention to cleanliness and ventilation, prevention of overcrowding, and the isolation of the sick, are the means which must be adopted for arresting its progress. The circumstances under which the disease becomes developed are now well known, and the nature of the preventive measures is sufficiently obvious.

For the treatment of those affected, rest in bed, good nourishing liquid diet, *e.g.* milk, soup, and wine, are the best remedies. Though the temperature may rise very high, it is seldom necessary to resort to cold baths; the pyrexia very rarely causes a fatal termination. Frequent sponging of the surface with cold or tepid water and cold affusion to the head will, however, afford much relief, and may be frequently repeated.

When the patient comes under treatment at an early period an emetic of ipecacuanha or mustard may be administered, and if the bowels be confined some mild purgative, as castor oil or rhubarb, may be subsequently given. Quinine has been largely employed, during both the paroxysm and the relapse; but it seems to have no effect in relieving the symptoms or preventing their recurrence. Small doses of nitre, frequently repeated, seem to produce a favorable effect by stimulating the action of the kidneys. It may be combined with dilute nitric acid and tincture of digitalis. The vital powers of the patient must be sustained by appropriate food and stimulants. Nourishment should be given in small quantities and at short intervals. Milk, beef tea, eggs, custard, bread and milk, form the most convenient and suitable dietary. After the paroxysm has ceased solid food will be requisite, and the quantity must be carefully increased. The appetite of the patients is often enormous, and it is sometimes advisable to enjoin a little restraint for the first few days. Quinine and the various preparations of iron may be given at this stage. Fresh air and a change of scene are highly desirable. The complications must be treated as they arise. Should signs of uræmia make their appearance, purgatives, dry cupping, poultices, or wet compresses to the loins, and the hot-air bath, are indicated, while diuretics may be given internally. The administration of lime-juice has been recommended for cases in which the kidneys have been much affected. For the pains in the muscles and joints opium is the best remedy; the liniment may be applied locally, and morphia injected subcutaneously. Diarrhœa or dysentery must be combated by astringents, combined with opium. A combination of opium with ipecacuanha is especially serviceable. The ophthalmia requires tonics and nutritious diet, with counter-irritation behind the ears. Should the iris show signs of inflammation a few leeches may be applied to the temple, and small doses of calomel, combined with opium and quinine, administered every few hours, until an effect is produced. A solution of atropine should at the same time be dropped into the eye.

YELLOW FEVER, HÆMOGASTRIC FEVER (BLACK VOMIT).

Yellow fever is rarely, if ever, seen in India. It is a malignant and generally epidemic fever usually continuous, of a very short duration and characterised by tenderness in the epigastrium, hæmorrhages from the stomach, nose, mouth, and bowels, and by yellowness of the skin and conjunctivæ. It is a disease of the tropics and low lying districts. It is most common in the West India Islands and the United States; cases have occasionally been imported into seaport towns of Europe. It attacks people of all ages, of both sexes, and of all conditions of life, and is a contagious disease of extreme severity spreading through fomites and excretions, as vomit and stools. The contagion retains its power for a very long time. One attack confers immunity from other attacks.

Causes.—The cause is a contagious virus or poison which multiplies itself in passing through the system and reproduces the disease. It is carried in clothes and by fomites, and by the atmosphere. Heat, moisture, certain states of the atmosphere, decaying organic matter, and general insalubrious conditions assist its development. It is said that it never spreads when the temperature is below 72° Fahr., and does not attack those who live in elevated places. Cases imported into Europe run their course, but the disease is not communicated to others.

Post-mortem appearances.—The rigor mortis sets in early and is well marked, the skin is more or less yellow. The yellowness is also noticed in the mucous membrane of the alimentary canal, and in the liver; the heart is pale and sometimes shows traces of fatty degeneration. The stomach shows signs of inflammation and contains more or less dark fluid owing to the admixture of blood with its contents. The liver in some cases is dry, anæmic, and friable, in others soft, pale, and flabby, and in a state of fatty degeneration. This last condition may be regarded as one of the characteristic lesions in fatal cases of yellow fever. The blood-serum is yellow, of a bad odour, of acid reaction, and deficient in fibrin, and contains excess of urea; there is destruction of red corpuscles.

The cortices of the kidneys are congested and contain fibrinous casts and casts of blood-corpuscles in the tubes. All the tissues of the body look pale and friable. The stomach and intestines contain black vomit, and their mucous membrane is thick, congested, and easily lacerable.

Symptoms.—Incubation varies from a few hours to two or even fifteen days. At the end of this period the patient is attacked with *febrile phenomena*, preceded by chills, restlessness, severe pain in the back and joints, headache, a tendency to coma, and a yellowish hue of the skin. The headache is especially characteristic; it is described as a peculiar pain in the forehead and eyeballs, while the appearance of the eye resembles that seen in the drunkard. This is soon followed by increased temperature, from 98°·4 to 102° to 105°, the pulse is very frequent, the respirations are hurried, the eyes suffused; there is great thirst, scanty high-coloured urine, and loss of appetite. This state is soon followed by tenderness in the epigastrium and incessant vomiting, at first of clear glairy fluid; the tongue is covered with a dark fur except at its tip and edges, where it is red. The pharynx appears reddened, the gums swollen, and bleed when touched. There is pain on pressure over the pit of the stomach. As the case advances the tenderness becomes more marked, and vomiting more frequent. The quantity thrown up is sometimes enormous, and it appears to gush forth without effort, and sometimes without consciousness. The skin is hot, dry and hard; eyes become deep yellow and jaundice appears, the urine is albuminous. On the third or fourth day the temperature rises to 105°, the urine now contains bile. The vomited matters become bloody or like coffee-grounds, and the bowels are constipated and the matters passed are dark or tar-coloured. There is frequent bleeding from the nose. These appearances are soon followed by symptoms of extreme prostration with delirium and dilatation of the pupils, or of uræmia or coma and convulsions. Besides typhoid symptoms, with marked bloody vomiting and jaundice, there are petechial eruptions on the trunk. From the second day the urine is scanty, high-coloured, generally albuminous, and often contains blood. Crisis may occur on the fifth day, but the duration may be from a few hours to two or three weeks.

Terminations.—In this disease there is a stage known as remission. The symptoms abate or temporarily subside, the temperature falls to 100°, but the nausea and sensitiveness of the stomach remain, and a kind of secondary fever sets in which generally terminates favourably, though the convalescence is tedious. In *favorable cases* the disease ends in two or three weeks, convalescence sets in, and there is subsidence of the grave symptoms. The pulse becomes slow, delirium subsides, vomiting ceases. The improvement begins on the sixth day, the patient feels well, passes stools which contain plenty of bile; the face becomes less yellow, and the skin is moist. In *unfavorable cases* the patient becomes more restless and delirious, and the breathing is much oppressed. There is hiccough, and collapse sets in at the end of a few hours; and very often he sinks at the end of the third or the fourth day, when the vomiting becomes black. Apathy is a prominent symptom. The urine becomes scanty or even suppressed; death takes place from hæmorrhage into the stomach and intestines, or from the ears or nostrils. The eyes become sunken, and the skin becomes cold and clammy. In other cases, at a later period, after a slow and apparent convalescence, death often takes place from cerebral complications, or from exhaustion or uræmic poisoning.

Pathognomonic symptoms.—These are sudden onset, high fever, severe headache (frontal), rheumatic pains, epigastric tenderness, crimson tongue and black vomit, jaundice, and scanty urine.

Diagnosis.—The diagnosis of yellow fever usually presents no difficulty. The endemic character of the disease, the jaundice, and the violent symptoms prevent any mistake. The remittent or ardent fever is not contagious and presents frequent recurrences, and can be combated by quinine.

Prognosis.—The black vomit, the suppression of urine, dilatation of the pupils, with coma, are very unfavorable signs. Death occurs from uræmic poisoning, exhaustion, or from apoplexy. Mortality is 1 in 3. The disease, however, varies greatly as regards its violence at different periods and places.

Treatment.—Cleanliness is all-important in dealing with epidemics or cases of this fever; disinfecting the clothes or the infected articles is imperatively necessary. The best disinfectants are quicklime, sulphate of iron, carbolic acid, chloride of zinc, and permanganate of potash. Any or all of these should be used freely. The infected articles of clothing should be boiled and subjected, when moist, to the fumes of burning sulphur. The houses should be thoroughly disinfected. The patient should be isolated. His excreta and other discharges should be burnt or buried with caustic lime. To prevent the propagation, personal contact with the infected persons or things should be avoided by all except the attendants, who should constantly change their linen and clothes, and well wash their whole body. The linen and clothes of the patient should be burnt. The dead should be immediately burnt rather than buried. During the attack confine the patient to bed and keep the room well ventilated; attend to the urgent symptoms. Remove the patient from the affected locality; from a warm to a cold climate, or from a low to a high land in a hot climate. Strictly maintain the recumbent posture. Give liquid and nutritious diet. Purgatives are advisable only at the onset. During the remission give large doses of quinine and nitro-muriatic acid. For vomiting give ice, stomach-soothing drugs, as chloroform, chlorodyne, morphia, or creasote, or solid opium.

Frequent injection of iced water containing a little salt does good. A wet compress over the epigastrium often subdues vomiting. If the urine is scanty and albuminous, use belladonna and omit opium. The fever may be relieved by warm baths and wet-sheet packing. As there is tendency to collapse use stimulants freely if the urine be free and copious. Of these, brandy and wine are the best. Ammonia does harm and should not be used, as the blood is often already ammoniacal. Mercury (calomel), in large doses, ten to twenty grains, is advised to be given at the onset, and some regard mercury as a most valuable remedy for this disease. They recommend that after the purgative dose the calomel should be continued in doses of two grains every two hours, until an effect is produced on the gums. Even when this result has been obtained, the administration of the mercury must be persevered with until the symptoms become mitigated. It is asserted that the system of a patient suffering from this fever will tolerate very large quantities of mercurials without the ordinary symptoms being produced. Throughout the whole course of the disease perfect cleanliness and free ventilation are necessary. The patient should be kept well covered in bed, and in a state of moderate perspiration. Some recommend pilocarpin as a diaphoretic in these cases.

Plague—Pestilence.

Plague is a contagious febrile disease, characterised by buboes or swellings of the lymphatic glands, carbuncles, petechiæ, and great prostration in the majority of cases. The disease is endemic in Egypt and in other countries bordering upon the eastern shores of the Mediterranean. In the Middle Ages, and so late as the sixteenth and seventeenth centuries, it appeared from time to time in western Europe, and was well known in England, France, Italy, Germany, and Holland. The last epidemic of plague which prevailed in England occurred in 1665. It was termed the " Great Plague," and caused the death of nearly 70,000 persons in that year in London alone. In 1720 it reappeared at Marseilles, where it carried off nearly one half of the population. During the present century it has appeared in an epidemic form in various parts of the Levant, Asia Minor, Syria, Egypt, Arabia, and Persia. In India, in 1876, a rapidly fatal disease, identical with the true Levantine plague, became prevalent in the mountainous districts of Kumaon, on the southern slopes of the Himalayas. A disease with similar symptoms has prevailed at intervals during the present century in Rajputana and adjoining districts. It is known as "mahamurri." Some of these last-mentioned epidemics were complicated by a peculiar lung disease.

Much difference of opinion exists as to the cause of plague. Some believe that it is propagated exclusively by a peculiar contagion; others that it is due to local causes or epidemic influences. The evidence in favour of a specific contagion, as gathered from the history of several epidemics, is very strong. Entire or almost entire exemption has been secured by isolating large bodies of persons, while persons exposed to infection, and having afterwards removed to a distant and healthy place, have fallen victims to the disease, which has afterwards spread in the new locality. It is generally supposed that the disease may be not only imparted from individual to individual, but that it may also be conveyed by means of clothing and articles of merchandise from place to place. It is still a problem whether the specific contagium of plague is exhaled from the patient's lungs or skin. The disease appears to be contagious before any boils or carbuncles have become developed. Inoculation with the pus from the buboes has sometimes produced the disease, and sometimes not. It is certain that privation, filth, overcrowding, and unhealthy conditions of the soil and atmosphere predispose to it. It is more common among the poor and ill-fed and hard-worked than among the rich and those who lead an easy life. When it was a common disease fear seems to have spread exaggerated reports of its extraordinarily contagious nature, and we may believe that most of the stories of its being conveyed long distances in very occult ways, and after the lapse of a long time, were due to circumstances which were rather seized upon to account for an outbreak than proved to have caused it.

Post-mortem appearances.—There is tendency to rapid decomposition, the blood is fluid, coagulates feebly, and the various internal viscera are engorged and soft. There are extravasations in the submucous and subserous tissues. The lymphatics are swollen, enlarged, and a few of them in a state of suppuration. The spleen is enlarged and softened.

Symptoms.—The disease sets in suddenly with rigors, followed by fever, frontal headache, pain in the back and limbs, and vomiting. The pulse is small, frequent, and irregular. The eyes are red and suffused; the face flushed, or even livid; the expression often resembles that of a drunken man. The nervous system is much depressed, the face is dull and apathetic, and the patient soon passes into delirium, coma, or convulsions. Typhoid symptoms soon follow, the bowels become loose, and there is occasionally suppression of urine. Hæmorrhages from mucous surfaces are common. The urine is sometimes blackish or tinged with blood. In this fever there is no true rash, but within two or three days petechiæ appear over different parts of the body, with swellings of the lymphatic glands in the neck, axillæ, or groins, while carbuncles also appear in the extremities and back. These symptoms continue till the beginning of the second week, when the glandular swellings either subside or suppurate. Many patients die on the fourth or the sixth day, but in severe cases death takes place within twenty-four hours, the symptoms being those of great nervous disorder and general prostration. In some cases the patient apparently goes safely through the attack, and after two or three weeks of apparent convalescence dies from complications.

Diagnosis.—Often confounded with typhus fever. The petechiæ are common in both, but buboes or carbuncles are rare in typhus. In typhus there is a true rash, which is absent in plague. In plague death occurs much earlier, for in typhus death is seldom seen within twenty-four hours. The percentage of deaths is greater in plague than in typhus.

Prognosis.—The disease is a very fatal one; in some celebrated epidemics more than half the patients have succumbed. The unfavorable symptoms are those which are characteristic of great malignancy, such as coma or delirium, hæmorrhages, hiccough, black tongue, &c. Favorable signs are: the occurrence of buboes without severe fever, moderate perspiration, and suppuration of the swellings.

Treatment.—An emetic, followed by a purgative, at the commencement, saline diaphoretics, tonics and stimulants as the case progresses, are the chief remedies. The buboes and carbuncles require local treatment, by poultices, &c. The patient should, if possible, be isolated, and all measures should be taken to prevent the spread of the disease. Cleanliness, ventilation, disinfection, or destruction by fire of all clothing, &c., worn by the sick, should be sedulously practised. The preventive measures may be said to be generally the same as in typhus.

Malarial Fevers.

Under this heading we include intermittent and remittent fevers. They are also known as paroxysmal fevers. These constitute a class by themselves. They are caused by the absorption of a poison that affects the blood. The poison, marsh miasm or malaria, is generated in marshy grounds and is of a vegetable origin. It is not a product of vegetable decomposition; but the putrefaction of vegetable matter, under the combined influences of moisture and heat, favours the development and increase of this poison. The disease does not spread. It is not contagious and is not reproduced in the system. The fever is endemic in marshy soils and low lands, is often epidemic in character but does not pass from one country to another. In India epidemics of ague often precede epidemics of cholera, and are frequently associated with dysentery.

The disease has no definite course or duration. It is readily acquired after a short residence in a fever locality. Once contracted it often returns after apparent cure, and the patient may be subject to occasional attacks for years or during the whole of life. The poison of malaria is especially potent after the dew begins to fall. At night it is far more abundant than during the day. It is dense and keeps in close proximity to marshy grounds and seldom extends to great heights above them. During the rains a layer of water protects the soil from the action of the sun and air, and the development of the poison is checked. It is carried by the wind to places miles distant. Water absorbs the poison, hence drinking water from swamps in fever districts gives rise to the disease. The poison is often retained by a belt of trees. Hence it is dangerous at night to sleep in jungles in malarious places. The soil and the marshy ground in the vicinity of rivers or lakes are the special homes of malaria. In fever districts the turning up of the soil which has long been untouched is often followed by an outbreak of fever. Cold has the effect of diminishing its ravages. Ague or intermittent fever is most prevalent in tropical countries and at certain seasons, especially after the rains, when the surface of the soil is beginning to dry up. A mixture of sea-water with rain-water, as occurs in marshes near Mahim and Vurlee in Bombay, (the high winds and tides forcing the sea-water into the marshes) leads to dangerous malarious fever. In such cases the various plants growing in marshes soon decompose. The yearly flooding from rivers which takes place over low marshy soil in their neighbourhood gives rise to an endemic form of fever.

The disease attacks individuals of all ages and of both sexes. It affects the weak as well as the strong. The predisposition varies with the individual peculiarity. Persons unduly exposed to cold or to other variations of temperature, those suffering from various excesses and debilitating [influences, or from errors in diet, generally get fever, although these same people, under favorable circumstances, may have remained free from attacks, even while residing in marshy places.

Again, these debilitating influences affect persons who have been infected with the poison, but have escaped attacks while in malarious localities, and produce fever after leaving them. Thus, the latency of the poison varies. In some persons, after exposure to its influence, the first symptoms of fever are manifested within a few hours; others, although residents in malarious places, even during bad seasons, may be quite free from the effect of malaria, and only after removal to a healthy locality they get a first attack of ague. It is also a well ascertained fact that residents in malarious districts become accustomed to the poison, and therefore less readily contract ague than those newly arrived. Thus, cases are recorded of persons going from Bombay during the fever months to Salsette, Bhandoop, Chumboor, or Coorla, and succumbing to the effects of these fevers, while the residents are often free from their ravages. When patients have had several periodic attacks of ague or suffered from fever for many weeks or months, chronic enlargements of the liver and spleen often take place. Such patients are also liable to suffer from various forms of cachexia.

The course of the complaint is uncertain. The disease, when left to itself, continues for a time, and may disappear without any treatment. Very often the patient suffers from the continued action of the poison, and manifests symptoms of ill health and deranged constitution, without any decided attack of fever; such patients appear pale and cachectic, and exhibit enlargement of the spleen; this is owing to the waste of tissue of the body. The danger from this latter cause is less in the intermittent than in other fevers, and this difference is due to the pauses or intervals which occur between the paroxysms, and also to the nourishing diet by which the tissues are restored. A very high temperature, 105° or 106° from the setting in of malarial fever, shows that the waste of tissue is very great. It is thus that fever patients get thin and emaciated in a short time. Where the disease is not checked by antiperiodic remedies the result proves far more serious, the paroxysms are not arrested, and anæmia and even dropsy may become established. At an advanced period permanent organic disease of the liver, spleen, or kidneys often occurs. The organic diseases end in degeneration with pigment deposits. Persons living in malarious districts do not always suffer from fever, but are often the subjects of other diseases, varying with the predisposition of the individual. Thus we find ague in one person, dysentery in another, and neuralgia or malarial cachexia without febrile attacks in a third.

1. *Varieties of intermittent fever.*—*Simple intermittent fever.*—It is a term applied to a more or less severe attack of periodic fever. It is characterised by a series of febrile attacks of some hours' duration; sometimes there may be only one paroxysm. The paroxysm is followed by periods or intervals of apparently good health or exemption from fever (apyrexia).

Symptoms.—Before the marked character is recognised the poison evinces itself by a period of *incubation*, which may last from six to sixteen days, and is attended with disturbance of general health. The patient suffers from loss of appetite, headache, and general malaise with chilliness, muscular pains, and weariness. These are known as prodromal symptoms, and are soon followed by the febrile phenomena. In some cases the paroxysm sets in without any prodromal symptoms. A paroxysm consists of a cold, a hot, and a sweating stage. The cold stage begins with yawning, and the patient stretches his limbs, shivers, and is conscious of a cold creeping sensation in the back or over the body generally, and he asks to be covered with blankets. The shivering soon passes into a severe rigor, with quivering lips, chattering of the teeth, convulsive trembling of the limbs, and shaking of the whole body. The surface of the body and the nose are cold to the touch, but the thermometer reveals a temperature of 103° or 104° F. In this stage the skin is dry like goose skin, the face looks dusky and pinched, lips are livid, and the nails bluish; hands and feet wrinkled and shrunken. The sensibility is also diminished; the pulse is small, hard, frequent, and often irregular; there is oppression of the chest; the speech is indistinct and interrupted; digestion deranged; there is retching and often vomiting of frothy mucus or bile; the breathing is quick, the tongue is furred and somewhat bluish; there is frequent micturition; the urine is pale, abundant, of low specific gravity; it contains excess of urea, uric acid, and chlorides; the phosphates are diminished.

The duration of the cold stage varies from a few minutes to three or four hours or more. In the first paroxysm it is shorter and less severe than in subsequent ones; when the attacks occur frequently and the disease lasts for a long time, the intensity and the duration are also less; in some cases the cold stage is not perceived at all. The cold stage is now replaced by slight flushes of heat or the hot stage. The hot stage commences gradually, seldom suddenly. The patient is conscious of flushes of heat and then permanent feeling of warmth till the heat becomes intense. The appearance now changes: the skin is dry and pungently hot, there are flushes of heat over the face and cheeks, and sometimes herpetic eruptions on the lips. The temperature continues to rise quickly and uniformly to 105° or 106°. The pulse is now full, frequent, and bounding; the carotids throb, headache and restlessness become more severe, and slight delirium often sets in; the respirations are hurried and oppressed, or they may become deeper and slower; the tongue is dry and thirst great; the urine is high coloured and of high specific gravity; the amount of excreted solids is still in excess; the enlargement of the spleen increases; very often the patient feels giddy, and becomes faint on trying to get out of bed. Duration varies from two to ten hours, when the hot stage is succeeded by the sweating stage. The oppression of the chest and hurried breathing are due to the arteries of the bronchi being in a state of spasm during the cold stage, as those of the skin. In the hot stage there is relaxation of the vessels, and we find increased entrance of blood into the previously bloodless tissues.

Sweating stage.—During this stage the patient feels comfortable. Perspiration appears in the armpit, on the back, or on the face, and extends over the whole body; at first it is scanty, but soon he is bathed in perspiration. The heat of skin abates; the surface is moist and cool. Headache and other distressing symptoms are relieved. The pulse now becomes of normal frequency, and is soft and full; the respirations are normal. Appetite returns; thirst abates; the tongue is moist. The urine is scanty owing to the loss of water by evaporation and by sweating; it is dark-coloured, rich in urea and uric acid; the chlorides are diminished. When the paroxysm is over the patient falls asleep. On awaking he is more or less exhausted. The temperature seldom remains very high for more than twelve hours; it reaches its highest point at the commencement of the hot stage. At the termination it falls down to 99° or 100° F.

In some cases there is a fall of about 3° or 4° after the first twelve hours of the paroxysm, and a complete intermission occurs and then a rise of about 2° within the next twelve hours. Thus there is a difference of about 2° F. between the morning and the evening temperature. In another class of cases the temperature after it has once gone down to 99° F., seldom goes beyond, but remains within the ranges of 97° and 99° F. for several days, when recovery takes place. Another variation may be noticed. In some cases the temperature ranges high between 100° F. in the morning and 103° F. in the evening, for three or four days, when it falls to 99° in the morning and 101° in the evening, and so remains for several days, till it becomes normal.—The duration of the last stage is shorter than of either of the other two. With the cessation of sweating the paroxysm ends and the intermission begins. The stage of paroxysm or the period occupied by the three stages may vary from two, four, to eight or twelve hours. It has been ascertained by repeated observations, that the longer the cold stage, the milder and shorter is the hot stage. When all the stages are well marked the disease is called complete intermittent. In Bombay many cases of fever occur where one or other of these stages is missing. Thus some cases occur without any cold stage, the attack beginning with a hot stage. Sometimes there is a violent cold stage throughout, or only a sense of chilliness or a creeping sensation on the back, and the paroxysm closes. These cases are called incomplete.

In favourable cases there is a regular periodic interval of apparent good health, after which the fever may recur, and this may happen again and again till the cure is effected. In rare cases and in asthenic persons the sweating stage may end in extreme prostration and even in death. In some cases at the end of the paroxysm the patient looks extremely anxious and almost dying. Where the sweats come on early, are profuse, and last for a long time, the patient soon becomes collapsed. In a few rare cases there is delirium or coma during the first two stages, and with the sweats there may be epistaxis or bleeding from the stomach, or from the bowels or from the kidneys. Generally during the paroxysm there is increased formation of urea and more or less enlargement of the spleen with induration. The spleen is especially swollen during the paroxysm and often subsides during the interval. With the recurrence of the fever the enlargement becomes more marked and finally permanent.

The duration of ague varies. With some patients it subsides on removing to another locality. In others it may remain for months or for years, and may recur at irregular intervals. It is seldom fatal. If death occur it is usually from exhaustion.

The interval.—There is a period called the interval, which is the time between the commencement of one paroxysm and the beginning of the next. It is to be observed that the rule is, the longer the interval, the shorter the paroxysm.

Types of fever.—These are arranged according to the frequency. The attacks occur regularly or irregularly. The regular types are, quotidian, tertian, and quartan, all these types are met with among patients within the tropics.

Quotidian.—It is the most common variety and occurs chiefly in summer. In it the paroxysm recurs in nearly or exactly twenty-four hours after the commencement of the last paroxysm, and lasts for sixteen hours. The accession of fever generally takes place in the forenoon at eight or nine in the morning, rarely in the afternoon or at night, and recurs at the same hour on successive days. The cold stage is the shortest, lasting only for a few minutes or for two or three hours. The hot stage is the longest and may last till late in the evening when it is followed by profuse perspiration. During the hot stage the pulse is frequent, 120, and the temperature is 104° F. The pulse is about 80, and the temperature falls below 99° during the commencement or at the end of the sweating stage. Throughout the night the temperature is at

99°, and it remains so till the next day when it again rises in the forenoon with a febrile paroxysm, and falls again in the evening with the decline to the normal degree. Where the fever lasts for many days or weeks, the scale of temperature is generally 98° in the morning and 99° in the evening, with an occasional rise from 101° to 103° for a few hours.

Tertian.—This variety is most frequent during or after the rains. The febrile paroxysm lasts from three to ten or twelve hours. The fever recurs every other day, the interval or the time between the commencement of one paroxysm and the beginning of the next is forty-eight hours. The attack is severe and sets in towards noon with chills. In tertian ague the temperature is nearly the same on alternate days. During the decline it falls to its normal degree and rises again with the paroxysm. On the next day it is normal throughout. Thus the temperature which was 102° in the evening of the 2nd, is also 102° in the evening of the 4th, 6th, 8th, &c., and normal on the alternate days.

Quartan is most common in winter and occurs in weak persons. The paroxysm recurs every third day. The fever is absent for two whole days and then recurs at the same hours, the interval being seventy-two hours. The fever comes on in the afternoon and lasts for two hours. In this variety the hot stage is the shortest, the cold stage is very long. It is a comparatively rare affection.

The irregular types.—The rhythm in which the paroxysms follow each other may vary. Sometimes the paroxysm may occur after an interval of many days or weeks. It may occur at an earlier hour than it did on the last fever day or may set in at a later hour than the previous one. Sometimes by the rhythm recurring at a later or an earlier hour than before, a tertian ague may change its type and become quotidian or quartan. We have another modification of the rhythm known as double quotidian, or double tertian, or double quartan.

Double quotidian is rare. In it there are two attacks or paroxysms of fever within twenty-four hours, one severe and one mild. Double tertian is the most frequent. In it the paroxysm occurs one each day, one day it is mild, another day weak, and the attacks thus correspond at the interval of forty-eight hours. The paroxysms occur daily but the time of their occurrence and the type of cold stage are different with each paroxysm. Thus the paroxysm may set in one day at 8 a.m. with chills, and on the following day at 10 a.m. without chills, the attack on the third day corresponding in severity and in type to that on the first day.

Double quartan.—The paroxysm takes place on two successive days, it is severe on the first day but mild on the second, and is altogether absent on the third day. The two paroxysms take place in seventy-two hours. The paroxysm then recurs on the fourth day and is as severe as on the first.

Another variety is known as irregular intermittent. In this form the paroxysm may appear for two successive evenings and then there may be a perfect intermission for two or three days, when a rise of temperature may again take place for one evening and may be followed again by an intermission for one or two days. Another modification of intermittent ague has been observed in which the fever for a long time is of a tertian type, and then changes into an intermittent quotidian.

There is yet another form. In this variety the patient is infected with the poison, but instead of the effects being apparent and expressed by febrile paroxysms, they show themselves as neuralgia, appearing periodically, the attacks being separated by regular intermissions corresponding to the intervals of intermittent fever.

Another variety of intermittent fever is known as algide or pernicious intermittent fever. It is a dangerous form of intermittent fever and occurs chiefly within the tropics; it seldom manifests itself from the first, but generally sets in after several paroxysms, and is seen for the most part in children, and in old people, and in very debilitated and sickly individuals. In it the fever is intense, and the paroxysm a very continuous one. In children the cold stage sets in with convulsions. In this affection the chill is very severe, and often lasts for a long time, the febrile phenomena which follow continue for several hours, leaving the patient very much exhausted. The high temperature of the body, remaining for several hours, ultimately leads to paralysis of the heart, and hence in it there is great prostration, stupor, collapse, and lividity of the surface. The temperature of the body at the end of the hot stage falls far below 98°. The skin is cold, pulse small and feeble. The patient becomes apathetic, and death takes place from asthenia. Very often the patient during the hot stage becomes comatose, from which condition he can partially be roused, or the coma may be so intense as to indicate the approach of death. In coma the breathing is stertorous, pupils dilated, and the skin over the forehead and face intensely hot. Sometimes in favorable cases drowsiness passes off, the intelligence is restored, and the fever subsides. Very often it ends in death, prostration and coma continuing for several days. During this period the heat of the body is intense. In some cases delirium sets in from the early period of fever, and in fatal cases it precedes the coma. Very often convulsions occur as a fatal termination. Another equally dangerous complication of malarial fevers is hæmorrhage from the bowels, or stomach, but chiefly from the kidneys, such cases are known as hæmorrhagic intermittent fevers. The patient suffers from several paroxysms of intermittent or remittent fever. During the second or third paroxysm, and during the hot stage, he suddenly passes blood in the urine, and the urine is also scanty. In such cases during the commencement of the sweating stage the urine again changes its colour, is free from blood, and is passed in large quantities. These cases are always serious. They are often seen in India. The disease is commonly associated with enlargement of the spleen. Besides the discoloration in the urine the surface of the skin also assumes a lemon colour. The patient often sinks into stupor or a state of great exhaustion, and dies in a short time. Under the microscope the urine is found to contain blood discs and pigment-granules.

Congestive intermittent fever.—Under this head are classed those cases where the fever is intense and its course associated with congestion and inflammation in different internal organs.

Intermittent or remittent pyrexia may occur in syphilis, tuberculosis, pyæmia, ulceration of the small intestines, lymphadenoma, hepatic and urinary diseases. It is often mistaken for typho-malarial fever. In all these cases the remissions or intermissions do not, like the true malarial type of fevers, assume a quotidian or a tertian type, nor do they yield to antiperiodic remedies.

Varieties—(a) Syphilitic intermittent fever.—It may occur at two different periods of the disease. 1. During the development of the eruptions. 2. Sometimes preceding or sometimes accompanying such constitutional symptoms as rheumatism or periostitis. The fever is marked either by a high temperature or by a violent shivering fit. The exacerbations usually occur towards evenings, while in the morning the temperature becomes normal. In some cases there are rigors, with heat of skin followed by sweats.

(*b*) *Tuberculous intermittent.*—In acute tuberculosis the obvious sign at first is fever either of an intermittent or of a remittent character. The fever may last for weeks or months without any discoverable local signs of tubercles. The rigors are rare, the hot stage is most marked towards evening, the temperature 103° to 106°, followed by profuse perspiration. Towards morning the temperature is generally normal. The fever is due to the deposit of tubercles in the lymphatic glands. There is burning heat of the palms of the hands and soles of the feet. Often these parts are bathed in sweats.

(*c*) *Pyæmic intermittent fever.*—In this fever the paroxysms are irregular. There may be rigors in only some of the paroxysms, but sweating is always present. The paroxysm seldom lasts more than twelve hours. There is no apyrexia, but the fever generally remits. The varied changes of temperature in twenty-four hours are remarkable. In this fever, as in ague, the septic poison is poured from time to time into the blood and thus excites rigors and fever. Pent-up collections of pus may also give rise to intermittent pyrexia without other symptoms of pyæmia. Thus in cases of empyema and of suppurative nephritis there are paroxysms characterised by rigors, heat, and sweating. The attacks cease after removal of the pus. In hepatic abscess similar febrile phenomena manifest themselves, but it is extremely difficult to distinguish fever due to pent-up pus from malarious ague. In hepatic abscess the local signs are not always prominently marked, the patient may suffer from fever, may have been in the tropics and have a history of dysentery.

(*d*) *Lymphatic intermittent fever.*—In some cases of lymphadenoma there is more or less fever with definite intermissions, the paroxysms being made up of all the three stages of ague. Very often the fever assumes a hectic character. During the attack the temperature often rises to 104° or 105°, the glands also swell and become tender. It is probable that some morbid material from the enlarged glands is poured into the blood and causes the febrile symptoms.

(*e*) *Hepatic intermittent fever.*—It commonly occurs in persons suffering from biliary calculi. In them the attack sets in with rigors. The temperature rises to 103° or 104°, and there is profuse perspiration. The function of the liver being deranged, the quantity of urea eliminated is considerably diminished, which is not the case in malarious or other fevers. The attack is attended with pain and tenderness in the right hypochondrium and epigastrium. Very often there is jaundice, dark-coloured urine, and pale stools. The attacks often recur with remarkable periodicity, and may even continue for weeks or months. In these cases the fever may be due to pyæmic inflammation of the liver due to impaction of gall stones and subsequent ulceration of the ducts. A kind of septic poison may also be developed in the stagnant bile and this may become absorbed and produce fever.

(*f*) *Typhoid or enteric malarial fever.*—Cases of enteric fever often occur with the usual phenomena of malarious fever. The patient for ten or fifteen days presents all the symptoms of enteric fever including rose-coloured spots and diarrhœa. At the end of that time the fever becomes more remittent and then intermittent. In the morning the temperature may be normal, but in the afternoon or towards evening the temperature rises to 101°, 102°, or 103°. During the night free perspiration takes place. This state continues for two or three weeks, although the paroxysm becomes each day shorter and less severe. On the other hand, the remittent or the intermittent may exist from the first, and after several days assume the type of continued fever—even antiperiodics have then no effect. The continued fever finally assumes typhoid symptoms. That these are real cases of enteric fever is proved by their occurring in the same family and possibly at the same time with typical typhoid fever.

Relapsing intermittent fever.—In this condition the patient passes through all the three stages of intermittent fever, and after an apyretic period of from five or seven days, or after the fourteenth from the first commencement of fever, all the symptoms of fever recur.

Diagnosis.—One chill or a single paroxysm does not necessarily indicate malarious fever. Other febrile conditions, as ephemeral fever, exhibit single paroxysms, and many acute diseases begin with a single cold stage. Two distinct rigors may occur in malarious fever as in hectic fever and in the early stage of phthisis. Hectic fever has a known cause. In it the patient is weak and emaciated, the paroxysms are irregular in time and duration, but the exacerbations occur almost invariably towards evening. The heat of skin is then most distinct, the cheeks are flushed, but the complexion is clear and headache is absent. The skin is seldom natural, it is generally harsh and dry, but is covered with perspiration at the end of the febrile paroxysms. The pulse is frequent. In suppurative inflammation there is evidence of the inflammatory affection.

Complications.—In intermittent fever the enlargement of the spleen, known as ague cake, is common, in some cases the enlargement occupies about two-thirds of the abdomen. The liver is also enlarged and indurated, and its functions deranged. In many cases the enlargement of the liver and spleen coexists in the same patient. There may be jaundice. In some instances there are derangements of the brain, lungs, and bowels, and in protracted cases delirium, epileptiform convulsions, bronchitis, diarrhœa, and dysentery, and also affections of the heart are common. Bronchitis is a very frequent but rarely dangerous complication. It increases with the paroxysm and remits with each apyrexia. In some cases there is profuse intestinal hæmorrhage, and this may depend upon acute congestion due to obstruction by blood-pigment in the hepatic capillaries. Protracted cases are followed by anæmia known as malarial cachexia. In highly malarious places, the people are low-spirited, pale-looking and ill-nourished. General dropsy is the result of complication, or is a sequel. The kidneys may also suffer from chronic desquamative nephritis. Albuminuria, hæmaturia, and suppression of urine sometimes occur. The ague poison also acts upon various branches of the fifth nerve and gives rise to neuralgia. That affecting the supra-orbital is especially known as brow-ague. These neuralgias are periodic, and occur in malarious places and are often associated with a distinct cold stage. In severe and protracted cases occurring in persons who have long resided in [malarious places, or who have long suffered from the periodic attacks, some degree of discoloration causing a peculiar dirty or bronze complexion is observed. This appearance is due to the disintegration of blood-corpuscles which takes place in the spleen, the corpuscles are converted into pigment-granules and these latter are deposited in various parts of the system.

Treatment.—The chief indications are:—1. To endeavour to shorten and, if possible, to cut short the paroxysm. 2. To carry the patient safely through all the stages. 3. To prevent the recurrence of the attack. Preventive measures should of course be taken with the view to check the development and spread of malaria. The marshes in whose neighbourhood fever prevails should be drained, and where the rivers annually cause flooding the overflow should be prevented by suitable precautionary measures. Persons residing in malarious districts in India should, as far as practicable, accommodate themselves to the mode of living of the inhabitants of that locality. Certain condiments, such as chillies, should be mixed with food, and clothing should be adapted to the climate and season. The tendency of the marsh poison is to cling to low grounds. The higher and drier dwellings above the general level should therefore be preferred. All debilitating and disease-producing influences should be avoided.

During the paroxysm very little can be done. The usual practice of covering the body during a chill with blankets and warm clothing is to be deprecated. These coverings do not warm the skin, whose circulation is very much obstructed; on the contrary, they tend to produce great discomfort and interfere with the already embarrassed respiration.

Treatment of stages.—In the cold stage the patient can be comforted by warm drinks, such as tea or coffee, by gentle friction to the skin with warm woollen cloths, or medicated fumes of frankincense or lavender leaves may be tried. A few drops (ten to fifteen) of Liq. Opii Sedativ. tend to bring on warmth and to check vomiting. When given in the hot stage opium shortens the fit and accelerates the advent of perspiration. It often produces soft and refreshing sleep. Sometimes an emetic of twenty grains of ipecacuanha given at the commencement of the cold stage prevents a paroxysm. It has long been the custom in the east to give hot-air or vapour baths to terminate the cold and shorten the hot stage and bring on sweating, but Hippocrates was against the practice, and his recommendation is confirmed by the experience of most physicians in the west. They maintain that though the fit is undoubtedly shortened, the effect is to produce a debility which prolongs the disease and endangers the patient's life. The minute account contained in Arrian of the last illness of Alexander the Great shows the bad results of the hot-bath system. The king was at first advised by his Greek physicians only to keep his room and to observe a regimen, just such as an English physician would order now-a-days, the use of quinine excepted. He did not follow their advice, but chose that of the Persian soothsayers who ordered repeated hot baths and frequent visits to a temple. The fever increased, owing to this debilitating treatment, and he sank rapidly and died, while in all probability he would have recovered had he followed his Hippocratic advisers. Thus it may be said of the hot-bath treatment that it once saved India from a conquest, but this is probably all that can be claimed for it. If prostration sets in, stimulants, as ether, camphor, musk, brandy, or wine, should be given from time to time, and sinapisms may be applied to the calves and præcordia, and hot bottles to the feet. General warmth may be induced by rubbing powdered ginger on the skin. Headache can be relieved by constant application of ice to the head, or of eau de Cologne and cold water; if the headache be very severe, leeches may be applied to the temples with benefit.

During the hot stage cooling drinks, cold sponging, and antipyretic medicines such as would promote sweating and diminish the heat of the body, are recommended. Gentle diaphoretics with nitre are the chief remedies.

During the sweating stage the patient must be kept in bed and well covered.

Treatment of the interval.—Of all antiperiodic remedies quinine is the most efficacious. Directly a paroxysm ends, or even during the sweating stage, it should be given in a full dose. It is to be repeated in decreasing doses for some time after an apparent cure or before the next paroxysm is expected. In Bombay, quinine in doses as large as forty grains is given with desired effect in cases where small doses have failed to prevent the paroxysm. Among the natives of India quinine often irritates the bowels, and in many cases mucus and blood are passed after its use. Bismuth or Dover's powder should be combined with it. Care should be taken in using very large doses of quinine, for they are apt to cause collapse, especially when the patient is anæmic. If there be great irritability of the stomach, twenty grains of quinine mixed with plenty of congee may be used as an enema by the rectum, or it may be hypodermically injected. A concentrated solution of quinine, one drachm containing ten grains of the salt, may be thus prepared:—Quiniæ Sulph. gr. 80, Acid. Sulph. Dil. q. s., Aquæ ℥j; dissolve by heating and filter. Then add Acid. Carbolic. ♏ v. The effect of injections is three or four times stronger than that of the same quantity taken by the mouth. In cases where exhaustion accompanies the interval stimulants with quinine are serviceable. Quinine in itself is not a sure antidote, but it relieves the most dangerous symptoms. Under its use the succession of paroxysms is checked, it prevents cachexia and enlargement of the spleen. Its action on the paroxysm is palliative. It also influences the disease by checking recurrences ; very often where quinine is used in large doses, the paroxysms do not recur until several weeks have elapsed. In long-standing agues, and especially those of a quartan type, where quinine alone fails to effect a cure, a combination of it with arsenic or sulphate of berberine, or often berberine alone, proves successful. If the patient is restless and excitable, quinine with Dover's powder will succeed well. In every case after the paroxysm is over, quinine in small doses should be continued for a few days. Where relapses are common it is advisable to give large doses of quinine a day or two before the expected attack.

Lately trials have been made with salicylic acid and salicylate of soda in fifteen grain doses as a substitute for quinine, and also during the hot stage to diminish the temperature and to promote perspiration, but without success ; hyperpyrexia returns while the patient is under its effects. It may be taken dissolved with biborate of soda or bicarbonate of soda, or in syrup of ginger. Chronic or long-continued cases tend to become anæmic or cachectic. In them various preparations of iron are beneficial. In cases of obstinate intermittents, where all remedies fail, the solution of arsenic has been often used with success. The following prescription is also useful :—Acid. Nitric. Dil. ♏xxx, Ext. Cinchonæ Liq. ʒjss, Liq. Strychniæ ♏viij, Mist. Camph. ℥iij. Misce. A third part three times a day. Nourishing diet with stimulants must be given at the same time.

Cascarilla or quassia, or other warm and agreeable bitter tonic, may be used to promote appetite. Chamomile flowers have been used in intermittent fever, mostly in children. It is said that hyposulphite of soda in gr. xv doses given repeatedly will cure ague, but the results of experience are not encouraging. Severe sequelæ are prevented by careful management and by quinine.

In algide or pernicious intermittent, the chief object is to relieve congestion of the brain. Any symptoms of coma that may be present are best relieved by the application of a cold douche to the head, a blister to the nape of the neck, and a brisk purgative if the patient be not very feeble. If the heart's action be weak, purgatives must be avoided and stimulants freely administered.

Hyperpyrexia with coma is a source of great danger, and should be reduced by external application of cold. In coma, opium, as a rule, is contraindicated. Very often, in the pernicious type of fever, delirium and restlessness exist from the first, and if not relieved prove a source of great danger. In them opium is the best remedy. If the patient be delirious and comatose opium should be avoided; quinine and stimulants should be given. During convalescence decoction of Azadiruchta Indica with diluted nitric acid, or other mineral acids with bitter infusions, may be given for a long time. Nutritious diet, warm and dry clothing, and a due amount of rest are necessary.

During the fever months persons should avoid malarious localities. The residents in malarious districts even while in health should take small doses of quinine to avert ague. In cases of poor people, where change is impossible, exposure at night should be especially guarded against, and also just before and after sunrise and sunset; sleeping under trees is especially harmful. If the weather be damp, fires will be beneficial. As a further and more potent preventive means attention to drainage of marshy lands and to the soil is always necessary. It takes a long time to eradicate malaria from a locality. In London ague used to be very common, and was accredited with numerous deaths. King James I, Oliver Cromwell, and the poet Marvell all died of ague in or near London in the seventeenth century. At the present day, though cases are still to be met with in undrained and uncultivated localities, ague is extremely rare in London. Agriculture, even tilling of the surface soil, and bringing waste land into cultivation, have a tendency to render a district less malarious, though even deep drainage will not entirely check the development of the poison until some years have elapsed. A belt of large leafy trees attracts the poison and is very dangerous to sleep under, but it forms a screen to windward and keeps off malaria, and therefore trees should be planted in all malarious localities. Large districts of Algeria have been rendered habitable for the French through the exertions of M. Trottier, who planted large numbers of Australian gum-trees (*Eucalyptus*). It must be borne in mind that jungles and other wild-wooded districts are often highly malarious. This is due to the large quantities of decaying vegetable matter, which is not found in artificial plantations where there are proper intervals between the trees.

REMITTENT FEVER.

Remittent fever occurs in places where malaria is abundant. Like ague it is common within the tropics, but is far more serious than the intermittent form. It differs, however from intermittent only in degree, and the two forms may alternate with each other in the same subject. The fever comes on in paroxysms once or twice a day, but does not intermit or altogether disappear. It is attended with distinct exacerbations and remissions of the febrile state. The recurrences of the remissions are in accordance with the types of intermittent fever and chiefly of the quotidian.

Symptoms.—In this fever the cold stage is very short, only a few minutes of shivering or a sense of chilliness represent it, or it may be altogether absent. The hot stage is well marked and prolonged, and the sweating stage is imperfect and often merges into a period of remission, which is generally of the same duration as the hot stage. In many cases the fever assumes after a few days a continuous character, and thus changes into a typho-malarial type. The attack of fever is sometimes sudden, but it is generally preceded by premonitory symptoms, as in the intermittent form, but of a more severe character. The febrile paroxysm begins with a rigor. The countenance is pale and anxious and there is dejection of spirits, and some headache, and pain in the loins and calves. The skin is dry. Pulse small and frequent. The temperature above 102°, sometimes as high as 103°. The digestion is deranged. Tongue is coated in the middle, and red at the tip and edges. Urine is scanty; acid reaction. The cold stage is followed by a hot stage which lasts for several hours, and often from seven to ten. During the hot stage the fever is high, the skin is hot and dry, the pulse small and frequent. There is intense heat over the whole body, difficulty of breathing, headache and pain in the back and loins, pain and swelling about the pit of the stomach, and enlargement of the spleen. There is great thirst and tongue is dry. Herpetic eruptions appear about the mouth. The urine is abundant or scanty, of a high colour, and if the temperature remain high for many days the urine contains albumen, and often blood with renal casts. There is nausea and vomiting, and the vomited matters are often black. Occasionally jaundice is present. Drowsiness and delirium are common. The patient often falls into a typhoid condition. In favorable cases the hot stage is followed by sweating or a period of distinct remission. These gradually pass into intermissions, or the patient feels well. Very often the recovery is marked by a gradual decrease of symptoms, the disease lasting for a few days or two or three weeks. In some cases the disease is more severe, and for a few days the heat of skin increases in severity, and there are distinct exacerbations instead of remissions. Sometimes there are two or three exacerbations in one day. When the exacerbations are many and severe, the remission after each exacerbation is generally very short. The principal exacerbation generally begins in the afternoon or towards evening and lasts for the whole night, or in some cases for the whole of the next day and next night, ending in a remission which begins by a gentle perspiration over some parts of the body. In such cases the remission lasts for a few hours, and the fever again exacerbates with the same force as before. Thus with remissions and exacerbations in favorable cases it at last ends in a crisis. Intermissions follow and precede convalescence. Pure remittent fever lasts from ten to twenty days, at the end of which period sweating or subsidence may occur suddenly and be followed by convalescence, or may leave the patient in permanent ill-health and liable to continual return. In unfavorable cases the temperature of the body is greatly increased, the face is highly flushed, delirium occurs, the tongue is covered with a dark brown fur, the pulse is quick and dicrotic, the respiration hurried and laborious. The fever merges into a low typhoid form. The remittent becomes a continued fever, and antiperiodics have no effect upon it. Similarly in asthenic cases, where the poison is intense, there is either no remission or the paroxysms become longer and the remissions less marked. The typhoid symptoms with delirium soon set in. There is retention of urine. Jaundice and other complications, as dysentery, pneumonia, &c., and in some cases hæmorrhages from the mucous membranes or vomiting of blood, usher in coma and death. I have often noticed that such results almost always follow the adoption of depressing measures in the treatment. The high temperature, pungent heat of skin, frequent and full pulse, and head-symptoms, as delirium or convulsions, and depraved secretions are most unfavorable signs. They often merge into sudden prostration or collapse. Very often the delirium passes into coma or into uræmic poisoning and death. In such cases death rarely takes place before the end of the first week.

Complications may manifest themselves in the brain, lungs, stomach, or liver.

Brain.—There is often delirium from the first, flushed face, suffused eyes, and intense vomiting, full and bounding pulse, all signs of disturbance of the functions of the brain; the patient often passes into drowsiness, coma, and death. Where delirium comes on at a later period of the fever, it is of a low muttering character, and indicates failure of vital powers.

Lungs.—Bronchitis and pneumonia are very common. Patients often suffer from cough with frothy mucous expectoration.

Stomach.—Vomiting, furred tongue, and tenderness at the epigastrium, jaundice, due to extension of gastro-duodenitis into the ductus communis choledochus, are common.

Varieties.—Abortive remittent fever.—It is a variety of remittent fever in which the temperature after continuing high for two or three days, or even longer, suddenly falls to 98° or even as low as 95°. The temperature then continues to vary between 96° and 98° until the patient has made a perfect recovery. The fever is at first of a continued character, but once a remission sets in there is no further exacerbation.

Infantile remittent fever.—This fever is identical with the enteric fever of adults, the pyrexia is of a more decidedly remittent type. In malarious districts, however, children equally with adults are liable to suffer from malarious remittent fever.

Treatment.—It is the same for remittent as for intermittent fever. We must endeavour to shorten the exacerbation and lengthen the remission, and to carry the patient safely through the exacerbation and prevent its recurrence. The complications should be treated as they arise, so also the urgent symptoms. Too strong a light, any noise, or motion should be avoided. As there is a tendency to determination of blood to the brain, the head should be kept elevated and ice or cooling mixtures may be kept constantly applied to it. The feet should be immersed in warm water with a little mustard every night. It is advisable to give an emetic at the commencement of the fever. The irritation of the stomach and bowels may be relieved by emetics, laxatives, and nourishing liquid diet. In very robust individuals, with full and bounding pulse, and throbbing of the temples with intense and constant headache, and bloodshot eyes, bleeding, leeches, cooling drinks, diaphoretics, and aperients if the bowels are confined, with frequent cold sponging, are useful remedies during the hot stage. During the remission give quinine in doses of twenty grains, to be repeated if necessary in smaller doses (five grains) every three or four hours. If there be much irritation of the stomach the quinine is best administered with salicylate of soda. Where internal administration in very large doses fails to produce remission, the remedy may be administered hypodermically, in doses of four or five grains once or twice daily. If, notwithstanding the use of quinine, the exacerbations still recur, give during the exacerbation salines, salicylic acid, salicylate of soda, various cooling drinks, and use cold baths. The good effects of cold baths are manifested by a diminution of the heat of the body and of the feeling of general distress, by tendency to sleep, regularity of pulse, moist skin, and by a distinct remission. Many use salicine, berberine, Warburgh's tincture, and Newbery's fever powder as a substitute for quinine in such cases. Very often, where the remissions are not perfect, antimonial wine or other diaphoretics, with tincture of aconite, veratria, arnica, or digitalis, may be given with benefit. Under this treatment the symptoms generally subside and the temperature and the heat of skin abate. Where the hot stage appears protracted and the patient is weak, quinine may be given with James's powder, and subsequently stimulants with opium. In ordinary headache application of cold or ice to the head will suffice, but if persistent, leeches to the temples will do good. If the patient be drowsy a blister to the nape of the neck will be necessary; for low delirium with drowsiness give stimulants by the mouth. Where the patient cannot swallow, nutritive enemata with stimulants by the rectum will do good, and if the temperature be also high, add to the stimulants a few drops of tincture of aconite. Complications must be treated on general principles. Anodynes, as opium, are useful to prevent restlessness, if the pulse be not much above 102, and there is no marked determination of blood to the brain. If the pulse be very frequent and weak, the fever persistent for six or seven days without distinct remission, and the patient feels great distress and restlessness towards the close of the paroxysm, even though there be no headache, no delirium or drowsiness, anodynes should not be given, for in such cases, the functions of the heart or brain being already impaired, the administration of opium may soon cause suspension of their functions and lead to death by coma or syncope. If with the fever of seven or eight days' duration there are also head-symptoms from the first, as delirium or drowsiness, the administration of anodynes is equally injurious, as it leads to coma. Vomiting is often the most urgent symptom; it may be relieved by effervescent salines, or by blister or mustard poultice to the pit of the stomach. As a matter of course only small quantities of liquid food should be given. In troublesome cases calomel with small doses of opium may be recommended. During convalescence I have often observed the beneficial effects of the Liquor Arsenicalis. It is also useful for the prevention of relapse. A long course of vegetable bitters with mineral acids is necessary for completing the cure.

A method of treatment for malarious fevers, suggested by the late Dr. Golding-Bird, seems to deserve more attention than has hitherto been accorded to it. Founding his recommendations on the well-known manner in which the kidneys often act vicariously for other organs, and remove from the circulation many of the products of metamorphosis, which, if retained, would act as poisons, Dr. Bird proposed that in the treatment of confirmed malarial fever, this depurative action of the kidneys should be stimulated by certain agents, and especially by acetate of potash. He noticed that in every case of ague a remarkable relation existed between the accession of each paroxysm and the diminished excretion of solids in the urine, and consequently less perfect depuration of the blood, and on the other hand, a notable coincidence between the free action of the kidneys, *quoad* the excretion of solids, and the improvement of the patient. Acting on these observations, he administered the acetate of potash in full doses, ʒij in twenty-four hours, and at the same time small doses, of gr. j, of Pil. Hydrarg. thrice daily. Under this treatment, which may be continued for some weeks, the skin becomes less dusky, the expression more healthy, the eyes clearer and brighter, the enlargement of the spleen and liver diminishes, and a short course of quinine and arsenic is sufficient to complete the cure. The urine, of course, is much increased in quantity. This method would seem to be especially deserving of adoption in chronic cases.

DISEASES OF THE SKIN.

The skin is an extremely complicated organ, consisting of (1) epidermis, or a horny covering, with its rete mucosum and special outgrowths, viz. the hair and nails; (2) the papillary and reticular layers of the cutis; (3) the subcutaneous connective tissue; and (4) an apparatus of sebaceous and sudoriferous glands. Any one of these constituents may be the seat of morbid processes, of which there are three principal kinds, viz. (1) alterations in the circulation, as known by congestion or inflammation; (2) changes in the nutrition leading to hypertrophy or atrophy; (3) disordered sensibility. As a result of these morbid processes various alterations take place in the appearance, sensibility, and functions of the skin and in its relation to the rest of the organism.

Classification.—Many classifications of skin-diseases have been proposed, but none of them rest upon a sound pathological basis, and they often serve rather to obscure the subject than to promote the true end of classification, inasmuch as they fail to express the exact relations and differences. It would seem, indeed, that for general purposes an alphabetical arrangement is as convenient as any other.

Before describing the separate diseases, their general symptoms and the points in which they resemble each other will first be noticed.

1. *Alterations in the circulation* consist of hyperæmia and inflammation and of congestion, the two former processes being active or arterial, and the latter passive or venous. Active hyperæmia gives rise to redness of the papillary layer of the skin, and may be either diffuse or circumscribed. The capillaries, being highly injected, look like minute bright spots. Inflammation may be common and due to ordinary constitutional causes, or may be specific and due to some blood poison. Common inflammation is represented by eczema, erythema, pemphigus, and anthrax. Specific inflammation includes the exanthemata, syphilis, and elephantiasis. The eczematous group comprises eczema, impetigo, lichen, and scabies. The erythematous group includes erythema and erysipelas. The pemphigoid group comprises pemphigus, herpes, and miliaria. The anthracoid group consists of anthrax, ecthyma, furunculus, and hordeolum. Of the specific inflammations the exanthematous group includes rubeola, scarlatina, and variola; the syphilitic group ery-

thema, papules, gummata, tubercle, and ulcer. The elephantous group includes the macular, tubercular, anæsthetic, and mutilating forms of elephantiasis.

2. *Changes in the nutrition of the skin.*—The diseases of the skin, as consequences of changes of the nutritive function, are represented by atrophy or absence of nutrition, hypertrophy or excessive nutrition, and dystrophy or altered nutrition. The atrophic group includes ichthyosis, morphœa, sauriosis, scleriasis, and striæ atrophicæ. The hypertrophic group includes angeioma, clavus, cornu, fibroma (general and partial), mycosis, warts, and spilus. Dystrophic affections include epithelioma, lepra or psoriasis, lupus, lymphoma, struma or scrofula, and xanthoma.

3. *Altered sensibility.*—Under this heading are included various skin-diseases, as dermatalgia, neuroma, prurigo, pruritus, and others characterised by impaired sensibility.

Results of hyperæmia.—Hyperæmia often ends in—1. *Papules:* These are minute prominences of the skin, varying in form, being rounded, conical, or flat. They are the result of hyperæmia, hypertrophous growth, or accumulated secretion of the skin. Lichen is the best example of papules due to hyperæmia. In papules there is at first congestion of the vascular layer of the follicles of the skin, and this is soon followed by more or less exudation into the capillary network. This condition when associated with accumulation of follicular contents constitutes a pimple, and is often followed by desquamation. When the exudation is of a plastic kind it forms a hard, solid, persistent papule, as in prurigo, strophulus, and lichen tropicus. As a rule papules are attended with itching. 2. *Vesicle:* This is the result of active congestion and of inflammatory serous exudation. In it the serum or sero-pus finds its way between the horny layer of the epidermis and the mucous layer beneath. The former becomes raised by the exudation into minute circumscribed collections or blisters, each containing clear fluid. The bleb may be minute, as in cutaneous affections termed miliaria, or of considerable dimensions, as in pemphigus. In eczema they are generally minute and frequently coalesce. In pemphigus they are of a large size, and form bullæ. In scabies they are generally acuminated, while varioloid vesicles are umbilicated. In the case of herpes they are developed in rings, projecting above the skin, and of a peculiar greyish or bluish colour. Where the vesicles are scattered and contain sweat-fluid the affection is called sudamina. These differ from vesicles, in that the latter are of inflammatory origin, and their contents are alkaline, and often turbid or tinged with blood or pus, while those of sudamina are clear and acid. Vesicles often contain pus-cells, and are thus converted into pustules. In its further course a vesicle loses its fluid by evaporation, absorption, or by rupture of the distended cuticle. It dries up into a thin scale, and terminates by desquamation without further lesion of the skin. 3. *Pustules* are characterised by more inflammation than occurs in vesicles, by deeper affection of the tissues, and by the loculi, containing pus, formed by the cells in the rete mucosum. Ecthyma and smallpox are examples of pustules. In other forms the pustules are large and deep seated, and have painful, hard bases. 4. *Squamæ or scales:* There is excessive formation of unhealthy epidermis. The scales consist of detached plates, which vary in size, and may be thin or thick, brittle and laminated, soft or hard, and of various colours. They are commonly seen in ichthyosis, lepra vulgaris or psoriasis, and pityriasis. They differ from crusts which are the result of drying up of discharges. These latter consist of detached epidermis and sebaceous matter, and are chiefly the result of inflammatory exudations and of pustules. The exudation may be serum, pus, or blood, alone or combined. When the serum alone forms a crust this is yellowish-brown and translucent. In the case of pus the scab is greenish and thick; and if blood be exuded it is dark-coloured or black. Crusts resulting from the hardening of an exudation of serum are seen in eczema, and from that of sebaceous matter in ichthyosis. In lepra the crusts are really due to overgrowth of the epidermis, and they form scales or raised masses over an inflamed base. 5. *Furfura, scurf, or dandruff:* A bran-like desquamation of the epidermis, and is chiefly seen on the scalp at the roots of the hairs. Scurf consists of a mixture of epidermis and sebaceous matter.

Tumours of the skin.—These may be homologous, as keloid and fibroma, or heterologous, as cancer, syphilitic gummata, and lupoid growths. *Thickening and exudation of sebaceous glands.* The resulting eruption may be scattered, as in acne, anthrax, and sycosis, or in groups, as in elephantiasis and molluscum. *Wheals* are temporary pale elevations of the cutis, the result of sudden dilatation of the capillary vessels. They may be flat or convex, and are several lines in diameter. They rapidly appear and disappear, and are accompanied by heat, tingling, and itching. They resemble serous papules, but in these there is exudation in the substance and around the hair-follicles. In wheals the pressure of the exudation upon the capillaries squeezes out the blood, and thus produces a pale centre with a bright red circumference. *Crusta lactea* (milk crust): These are formed by the drying up of the discharge poured upon the surface of the skin through an inflamed derma, as in eczema pustulosum; or from ruptured vesicles, as in rupia; or from an ulcerating surface. They may also be due to a collection of fungus-elements, which irritate the scalp and affect the hair-follicles, as in favus.

Ulceration.—It is the result of inflammation in cachectic, strumous, or syphilitic subjects; or of morbid growths replacing the normal tissues and undergoing softening and decay. Cancer is the best example.

Excoriations result from a superficial destruction of a portion of the skin or mucous membrane. They signify mere exposure of the true skin without any removal, and are generally due to scratching or friction. When in the bends of the forearms and thighs, these excoriations suggest scabies, and when about the shoulders, phthiriasis.

Scars are the result of injury, caused by wounds or application of caustics; they also occur in skin-diseases which have a tendency to ulcerate, as smallpox; in strumous and syphilitic diseases; in anthrax and herpes zoster. The production of a scar depends upon the depth and character of the inflammation, and its presence indicates destruction of the true skin, which is replaced by cicatricial tissue. The fibrous tissue on contracting leaves a pit or depressed white mark.

Macula, a spot or stain, is a discolouration of or pigmentary deposit in some portion of the skin, and is due to the colouring matter of the blood. The discolouration does not fade on pressure. The term includes sunburn, nævus, and spilus. Maculæ may be secondary to syphilis, pregnancy, Addison's disease, or leprosy. In most cases they are simply chronic without being permanent. Maculæ may be hæmostatic as in vascular nævi, or hæmorrhagic, as in purpura and in bruises. The stains are superficial red patches, variously figured and diffused over the body, leaving interstices of healthy-coloured skin.—Other diseases of the skin are the result of plant-formation or vegetable parasites, and include tinea and favus. The diseases of the nails are those which affect the nails proper, and the soft parts in their immediate vicinity. The affections of the nail proper include alterations of colour, texture, figure, and development.

Disorders of the cutaneous glands.—These comprise alterations in the gland-structures and their functions. They include a group of steatopathic and idrotopathic affections. The steatopathic disorders include (1) steatorrhœa, where the sebaceous secretion is in excess; (2) comedones or impacted secretion; these occur as small round black spots on the surface of the skin, which when squeezed give vent to small masses resembling minute maggots with black heads; (3) molluscum contagiosum or a specific degeneration of the cells of the rete Malpighii; (4) encysted tumours resulting from dilatation of the follicles with sebaceous secretion, and sebaceous horns, due to the desiccation of inspissated sebum. The idrotopathic or sweat-disorders include hyperidrosis (excessive secretion), anidrosis (defective), osmidrosis (fœtid), and chromidrosis (coloured). The sweat-glands are also liable to inflammation.

Disorders affecting the hair and hair follicles.—Those of the hair comprise alteration of quantity, colour, and structure ; those of the hair follicles include acne, favus, folliculitis, and gutta rosacea.

In treating diseases of the skin we should endeavour to trace out their origin and course, and determine their various stages. The affections often come under observation long after the earlier stages have passed, and at a time when the malady has become chronic and indolent, and has lost its characteristic features. In such cases the history may be the principal guide. It must be remembered that two or more kinds of eruptions are often associated together in varying proportions.

Causes.—These are generally identical with those which give rise to disorders of other organs of the body. Special diatheses and various other constitutional peculiarities are common originators of skin-diseases. Its peripheral distribution, and its consequent exposure to friction and to the influences of atmospheric changes, render the skin especially prone to take on inflammatory action ; and those causes which tend to produce inflammation, such as exposure to heat or cold, undue irritation, mechanical or otherwise, play a prominent part in the causation of skin-diseases. Like other organs, healthy nutrition and innervation materially affect its condition. Its diseases are common in the young, and are often the result of imperfect digestion and of deranged assimilation. The nutrition being defective, the skin loses its power of resistance and yields readily to the action of external and internal irritants ; hence delicate children are prone to eczema, lichen, and acne. The cause may, however, be an exanthematous fever poison, and the disease may develop in an otherwise healthy child. When skin-affections occur in old people they are often due to senile degeneration, and in the case of adults the habits and occupations of the individual have a great influence in their production. Defective nutrition is evinced in alopecia, achroma, ichthyosis, lupus erythematosus, lepra vulgaris, &c.

Certain disturbances of innervation give rise to discolouration of the skin as in Addison's disease, and to eruptions such as herpes. Poisonous articles of food sometimes produce skin-eruptions. Thus urticaria often follows the use of certain kinds of fish as mussels ; and certain drugs, as cubebs, copaiba, iodide and bromide of potassium, and quinine occasionally give rise to certain kinds of rash. Many diseases of the skin are capable of hereditary transmission; *e.g.* syphilis, ichthyosis, psoriasis, eczema, and lichen. Derangement of function and organic diseases of internal organs often produce skin-disease. Age and sex have also an important influence in this respect. Thus, lupus is common in women, sycosis in men; porrigo is peculiar to children; acne and tinea tonsurans to young people, while pityriasis versicolor occurs among adults. Various general diseases, as rheumatism, gout, &c., favour the occurrence of psoriasis and eczema. Alcohol is said to generate acne rosacea. Various local causes, as want of cleanliness, may give rise to eruptions on the scalp. The application of irritants to the skin and even rough clothing, excite various forms of eczema; mere scratching of the affected skin often propagates the disease to other parts or modifies existing eruptions.

Symptoms.—The existence of a cutaneous affection is indicated by alteration of the colour, texture, and sensibility of the skin. Change of colour may be the consequence of altered circulation or variations in the amount of pigment. Active hyperæmia gives rise to brighter tints of redness as noticed in eczema, erythema, scarlatina, and urticaria. In other cases the colour is less bright, and often borders on purple, as seen in roseola, rubeola, and the syphilodermata. The discolouration is bluish-black when it results from venous congestion as in morbus ceruleus, chilblains, and anthrax. Nævi present different colours; scarlet, crimson, purple, or blackish, according to the activity of the circulation through them. In purpura and ecchymosis, the colour ranges between crimson and black. Redness may be transient, as in erythema and urticaria; or more permanent as in eczema or erysipelas; or continuous as in boils and anthrax. Permanent redness is a special characteristic of vascular nævi. The redness may be circumscribed or punctiform, as in strophulus; or in patches as in roseola; or accompanied with swelling due to inflammatory effusion, as in erythema papulatum.

Alteration of the colour of the skin may result from changes in the rete mucosum, the seat of the pigmentation of the skin. It may be pure white, as in the albinos; yellow and brown, as in chloasma; and deep black, as in melasma. Changes may also be met with in the tissue of the corium, as in xanthoma, where it is yellow.

Texture.—Changes in the texture of the skin are discoverable by the touch and sight. In infiltration of the cutaneous tissues, besides redness, the eruptions appear slightly elevated, and communicate to the hand a feeling of density and thickness, as may be observed in erysipelas and erythema. In infiltrations with hyperæmia and hypertrophy the changes of texture give rise to pimples or to tumours of the substance of the skin. The skin is often very hard, dense, and rough, as seen in chronic eczema, lichen planus, and lepra. The increased thickness of the skin may be due to hyperæmia with infiltration, to simple infiltration, to infiltration with hypertrophy, or to development of some new tissue. The thickness may be confined to the skin; it may involve the subcutaneous tissues, or may affect separately the glands, the papillæ, or the fibrous tissue of the corium.

Sensibility of the skin.—Disordered sensibility is manifested by varying degrees of hyperæsthesia and anæsthesia, itching, tingling, pricking, and abnormal sensations of heat and cold.

Diagnosis.—In diagnosing a disease of the skin the symptoms apparent on the surface of the body are the main guides. The history of the case and the patient's own statements should be noted. The whole of the eruption, and in some cases the whole of the body, should be minutely inspected. Certain skin-diseases, as eczema, lichen, scabies, and prurigo, are always attended with itching, a symptom which is not noticed in syphilitic eruptions. The scratching frequently alters the appearance of the eruptions, and these, again, in many cases are of different varieties. Thus, eczema is often found associated with scabies and psoriasis. In many cases the eruptions are abortive; thus, in modified smallpox the vesicles, instead of forming pustules, often wither and desiccate. We have also to determine whether with the eruption the constitution is involved or not, the patient cachectic or healthy, the temperature high or normal, the fever, when present, intense or slight; also whether the disease came on suddenly or gradually, whether it is attended with local inflammation, or with secondary results, as seropurulent discharge, bullæ, pustules, or scales. Age, duration, and regional distribution should also be considered in forming a diagnosis.

Prognosis.—In the majority of cases of skin-affections the prognosis is favorable; the diseases are seldom fatal, but many of them become chronic, while some cause annoyance by the unsightliness, itching, or even pain to which they give rise. The prognosis depends upon the cause and upon the individual peculiarities. Eczema generally originates in malassimilation, while erythema and urticaria are symptoms of constitutional diseases. Pemphigus indicates extreme cachexia and asthenia, and in such cases the prognosis is unfavorable. In anthrax the pain and suffering are always great, and patients may die from constitutional complications. Diseases of the skin due to specific causes are generally curable unless complications occur. Elephantiasis which results from disordered nutrition is generally incurable. The same remark applies to many nutritive disorders, as the constitution is already in a very feeble condition. In neuropathic affections the prognosis depends upon the condition of the nerve centres or nerve trunks.

Treatment.—There is nothing absolutely special, and the same general principles of therapeutics are applicable in these as in other diseases. The treatment consists of local applications and constitutional measures. The local remedies are soothing, stimulant, or caustic in their action. The affected parts should be protected from irritation and prevented from becoming dry and cracked. Collodion and various oils are useful applications for these purposes. Absorption of exudations should be promoted, and resolution aided. Growths sometimes require surgical means or caustics for their removal. In erythema, eczema, seborrhœa, and squamous eruptions astringents, as alum, acetate of lead, borax, bismuth, myrrh, tannin, and oxide of zinc are very useful soothing remedies. In lupus, condylomata, epithelioma, and various other unhealthy ulcers bisulphide of mercury, arsenious acid, caustic potash, chromic acid, powdered savine, and carbolic acid are useful as stimulating applications. Plasters are often serviceable applications in syphilitic papules, acne rosacea, tubercles, and indurations. Those containing mercury are used with benefit in lepra, chronic eczema, and psoriasis. For boils a plaster made of camphor, pitch, red oxide of lead, and salad oil, and known as the emplastrum fuscum, is a good application. Sedative applications are used in cases where itching is severe, as in eczema, urticaria, pruritus vulvæ, and various similar eruptions. Morphia, chloroform, belladonna, digitalis, and camphor are all more or less suitable for this purpose. Various preparations of alcohol, oil of lavender, iodoform, iodine, mercury, and sulphur are also used in skin-diseases. Tar is used in psoriasis, and also in vesicular and papular diseases. Nitrate of silver is often useful in eczema and erythema. Vegetable parasites, as those of favus and tinea, and all other forms of ringworm, are locally treated by various preparations of mercury and iodine, by liniments of ammonia, by lotions of cantharides and of carbolic acid, and by blistering fluids. Absorbent remedies are applied to excoriations, the most useful of them being fuller's earth, oxide of zinc, and powdered starch. The object of constitutional treatment is to restore the vital powers and the healthy functions to a normal condition. Baths are useful adjuncts. In erythema, scabies, and in scaly diseases, baths of hot water infused with bran and gelatine are generally serviceable. In eczema, psoriasis, urticaria, and other skin-diseases, attended with a considerable amount of local irritation, baths of the alkalies, as bicarbonate of soda or of borax, with hot water, are to be recommended. In chronic skin-diseases hydrochloric or nitric acid is added to the bath with good effects. Sulphur baths sometimes act better than the alkaline or the acid baths. In syphilitic eruptions mercurial vapour baths often constitute the best form of treatment. In all these cases the patient must be allowed to remain in the bath for at least twenty minutes. When the disease is due to deficiency in the quantity and quality of the food, and to unfavorable sanitary conditions, tonics, good food, cleanliness, and fresh air are indispensable to recovery. In plethoric subjects, and in those who live luxuriously, skin-diseases can often be checked by attention to diet and regimen. Eczema and psoriasis often arise from defective excretion, and are common accompaniments of dyspepsia, gout, rheumatism, &c. In these cases the diet should be carefully prescribed, and aperients and alteratives are indicated. In acne, psoriasis, eczema, erythema, and papular affections, preparations of mercury and iodide of potassium, with iron in some form or other, are often useful. Where nutrition is defective, as in lepra, minute doses of arsenic are recommended. Some use iodide of sodium in obstinate syphilitic eruptions where iodide of potassium fails or disagrees. In eczema of the legs, with œdema or hyperæmia of the skin, various diuretics and aperients are needed, and digitalis may be added if required. Where the disease is inflammatory scratching should especially be avoided, and air excluded from the inflamed surface by suitable means. After congestion has been subdued astringents or stimulating applications are useful in promoting absorption. In all cases of skin-eruptions, constipation, torpid liver, and dyspepsia are very common accompaniments, and must be carefully treated. Where secretions are suppressed or retained the skin tries to take on a compensatory action, and so becomes diseased. The retention of the secretions also leads to a diseased state of the blood, and thus aggravates skin-diseases. Thus in torpor of the kidneys eczema of the legs is common. In all cases the general health, the condition of the internal organs, and, in females, of the menstrual function must always be attended to.

Acne.—It is an inflammation of the hair-follicles resulting from the retention of sebum. It attacks the face, shoulders, the submastoid region of the neck, back, and sternal region of the breast. It is most common at or after puberty when the hair-follicles are in a state of great activity. The skin is torpid; the sebaceous glands contain unnatural secretion, and are either open, or have their orifices obliterated. When open the orifices are dilated and prominent, and on pressure they emit maggot-like bodies or comedones and sero-purulent fluid. Where the orifices are closed, the contained sebum forms a hard pearly mass of a yellow colour, as seen in the faces of children. In acne a tendency to the accumulation of sebaceous matter within the hair-follicles leads to congestion of the coats of the follicles, and of the contiguous structures; followed by inflammation and its results, such as suppuration, infiltration, and solidification. The accumulation of sebaceous matter often gives rise to a series of papules or black points with little or no inflammation, and then called acne punctata. Congestion and infiltration of the follicles give rise to conical pimples known as acne coniformis, and when they suppurate they are known as acne pustulosa. Where there is considerable thickness and induration at the base of the follicles with a certain degree of suppuration, the complaint is known as acne indurata. Folliculitis is sometimes produced by iodine, bromine, and tar. The term acne simplex includes all the varieties of the disease with the exception of acne indurata. Another form, acne rosacea, is an inflammation of the follicles of the nose in particular, and the affected part is highly vascular, and its blood-vessels are in a varicose condition. It forms large patches of redness, associated with effusion into the cutis. There are scattered tubercles upon the inflamed patches, and these in a majority of cases remain permanent. In persons addicted to alcohol, the patches become more developed, the nose swells, and may form a lobulated pendulous mass. The affection is common in women suffering from disordered menstruation, and also in dyspeptic persons. It is aggravated by errors in diet and by local irritants. The existence of syphilis and struma tends to promote suppuration and ulceration, and thus modifies the disease. Acne vulgaris is sometimes hereditary and always chronic, and generally occurs in persons between eighteen and twenty-four years of age.

Treatment.—As the disease is generally due to disordered nutrition, attention must be paid to diet and regimen. Symptoms of dyspepsia, debility, and disordered uterine functions must be inquired for, and treated, if present. Tonics and cod-liver oil should be given if struma exists. For syphilis, iodide of potassium is indicated. The best constitutional remedies are ordinary tonics and more particularly arsenic. It is best administered in combination with iron; vinum ferri ʒij and liquor arsenicalis ♏ij to ♏iv, may be given three times a day after meals. Locally, in acne punctata, warm baths, alkaline washes and friction with soap and water are useful remedies. In acne indurata, the indurated spots may be touched with nitrate of mercury. After the irritation has subsided and the cause removed, sulphur in any form may be locally applied. The most efficient application is an ointment of hypochloride of sulphur, one drachm, carbonate of potash ten grains, and benzoated lard one ounce.

ALBINISM.—The word means absence of colour of the skin due to defect of pigment-formation. The affection may be congenital or accidental; may affect the whole organism or be confined to limited portions of the body, and may be complete or incomplete. When confined to a few spots the appearance is known as *piebald.* When the discolouration is universal the iris and the choroid are also affected. The characteristic features of an albino are: 1. The skin is white and pink and more or less transparent; in dark-skinned persons in whom the pigmentary functions are defective, the colour of the skin is grey or tawny and more or less freckled. 2. The colour of the hair varies; it may be pure silvery, or tinged yellow or red. In some cases the eye-lashes appear purely white, and the whole body is covered with a white down. 3. The iris is grey or pink, and in dark races, it is often blue; the pupils generally are contracted and appear red. The eyeballs oscillate. 4. Vision is imperfect, there is intolerance of light; the patient walks in the daytime with a stooping head and droops his eyelids to shelter his eyes. He is near-sighted and can see better in the dusk. Albinos are met with in India as in other parts of the world. The affection is less common in males than in females. Congenital cases are more common than others, but very little is known about the etiology of this disease. Insalubrious climate and defective hygiene would seem to have some share in its production. Heredity has been often noticed as one of its main causes. Albinism is found associated with very opposite conditions of physical and intellectual vigour.

Treatment.—Very little can be done by way of treatment in such cases, beyond improving the state of the general health and sheltering the eyes from the glare.

ALOPECIA.—The word means baldness or loss of hair, varying in amount and either temporary or permanent. The hair may become very thin or may be completely wanting. The latter condition is known as alopecia calva, in which not only the hairy scalp, but also the eyebrows, eyelashes, beard, pubes, and armpits are involved. In another form the affection is partial and affects mainly the summit and forehead in males, and the summit and occiput in females. In alopecia areata, the patch has a circular outline; its surface is smooth, shining, and free from scurf and congestion. The skin over it is thinner than in health and the hair-apertures are distinct. Such circular patches are occasionally met with in the whiskers and beard. The patch may present downy hairs here and there, or a few scattered long hairs may stud its surface, and in the immediate neighbourhood of these patches short club-shaped hairs may be seen. The affection is due to deranged nutrition of the skin, often consequent on advanced age. The condition may be partial or general, it may be hereditary or acquired, and idiopathic or symptomatic. Partial alopecia may result from a blow, from the tearing out of a lock of hair, or from nervous shocks. When symptomatic it may be due to blood diseases, as syphilis, parasites, or to nervous debility. Idiopathic baldness results from failure in the formation of hair owing to atrophied condition of hair-bulbs, or to defective nutrition or exhausted nutritive power of the cuticle. Alopecia areata is due to some nervous lesion.

Treatment.—The main indications are to restore the nerve power of the skin and to stimulate the part locally. The best stimulant applications are ammonia liniment, compound camphor, and mustard and chloroform liniments. Oil of cantharides and acetum cantharidis carefully brushed into the spots are very useful for alopecia areata; turpentine and iodine are also recommended. If due to syphilis, the white precipitate ointment locally and iodide of potassium or mercury internally are the proper remedies.

ANGEIECTASIA.—The term signifies extension or hypertrophy of the minute vessels of the surfaces of the body, especially of the skin. Under this head we find several forms of vascular nævi, or tumours composed of blood-vessels; one form of nævus is called capillary angioma. Some of these growths form tumours, while others cause no increase in the size of the affected part. The nævi or "mothers' marks" are nearly always congenital. They may be cutaneous or subcutaneous; the latter present a purplish tint. Their growth is often rapid, and though their presence causes no danger to life, they may lead to considerable disfigurement. A nævus is composed of capillaries, veins, and arteries with connective tissue and fat, and sometimes sweat or sebaceous glands. The congenital moles are closely allied to nævi.

Treatment.—In some cases a cure may be obtained by injecting into the tumours some irritating substance as carbolic acid. Some recommend galvano-puncture; others the application of caustics, especially the fuming nitric acid. Pressure and the use of a ligature are sometimes successful, and excision of the growth is occasionally practised.

Another form of nævus is made up of larger vessels and is known as pulsating nævi or cavernous angiomata. In structure they resemble erectile tissue; they are of a dusky colour and often present a distinct thrill or bruit.

Anthrax.—The term is synonymous with carbuncle and malignant pustule. The word literally means coal.

Carbuncle is a specific local inflammation of the subcutaneous areolar tissue. The inflammation is phlegmonous, and leads to rapid necrosis of the deeper and more central parts. The necrosed tissue forms a slough, which is discharged with pus through several apertures in the skin. The parts of the skin surrounding the apertures are red, tender, brawny, and indurated. It is a constitutional disease, and the patient is cachectic and often diabetic or gouty. Carbuncle is more common in men than in women; it is rarely met with in persons under forty, and all classes seem equally liable. The most common seat of the disease is on the back of the trunk or of the neck, and over the ankles; it is occasionally found in other situations. It commences as a painful and hard swelling, attended with irritation of the lymphatic vessels and glands. The swelling gradually increases and assumes a dusky red tint. A dark-coloured bleb forms over the prominent part of the elevation, and on bursting exposes several small apertures to view. These give exit to a glutinous purulent discharge and may remain open and distinct for many days, or may coalesce and form one large opening exposing the ash-coloured slough. This is very tenacious and some time elapses before it is separated and discharged. After the separation of the slough, a large undermined cavity, with deep and irregular edges, remains. In unfavorable cases the cavity extends under the skin until it forms a very large excavation. In the early stage carbuncle is always painful and attended with irritation and a burning and throbbing sensation in the part. When the discharge becomes profuse the pain generally diminishes, and may even altogether disappear. Where the carbuncle is large there is extensive sloughing and ulceration, and pyæmia or constitutional disturbance of an asthenic type is a common accompaniment. Carbuncle is generally single, but two or more may occur in close proximity and run together. The swelling is more or less circular in form, varies from an inch to six inches in diameter, and is surrounded with a broad areola of œdematous skin. In favorable cases the excavation is filled up with granulations; the inflammatory thickening of the surrounding tissue diminishes, cicatrization takes place, and the swelling slowly disappears. The cicatrix left after healing is very uneven and often discoloured. In unfavorable cases death is due to asthenia or to pyæmia, and its advent is sometimes accelerated by free hæmorrhage.

Diagnosis.—Carbuncle may be mistaken for boil. The size, seat, and extent of the swelling, its tendency to spread, the livid hue of the skin, and numerous apertures in it from an early date are characteristic of carbuncle. In carbuncle there is constitutional disturbance and the discharge is peculiar.

Prognosis.—The case is generally fatal if the disease be seated on the back of the neck, if the discharge be profuse, and constitutional cachexia or such complications as gout or diabetes coexist. The existence of albuminuria is also a very serious complication. The prognosis in persons above fifty is always grave.

Treatment.—The main indications are to improve the state of the general health and to relieve the suffering. The diet should be nourishing, given in small quantities and repeatedly, and wine or brandy should be allowed according to the state of the patient. Fresh air should be freely admitted into the patient's room, and he should take as much exercise as his condition will allow. Attention to the secretions is of equal importance. The bowels must be regulated, and if constipation exists, gentle aperients are necessary. Internally iron, and other tonics such as bark, mineral acids, and cod-liver oil, are useful. The suffering if intense may be relieved by opium. In the early stage collodion may be applied to the part or it may be covered with galbanum and opium plaster, a hole being made in the centre to allow the escape of the discharge. For the relief of pain large linseed or starch poultices are useful; they may be sprinkled with dilute solution of acetate of lead. When the swelling becomes soft and doughy, poultices should be dispensed with. To hasten the separation of the slough turpentine or balsam of Peru dressing is a good application. If the discharge be profuse a small piece of nitrate of silver thrust into the cavity will promote granulations and lessen the discharge. Incisions in the early stage give relief to pain, but as they increase the loss of tissue, it is, on the whole, better to avoid them. If made, they should be free, crucial in form, and should extend beyond the carbuncle. Where the carbuncle is sluggish and the granulations weak, carbolic acid lotion answers well. Some recommend liquor potassæ in ʒss doses for adults three times a day.

Boils.—Otherwise known as furuncles. They are due to a phlegmonous inflammation of the skin involving the cellular tissue, and the glandular structures. They form small painful swellings, the centre of which is filled up with a core which is discharged with pus. The inflammation attacks the hair-follicles, and the sweat-glands especially of the armpits, and sometimes the glands of the lips, vulva, and anus.

Causes.—In India, boils are common accompaniments of roseola in children, and are probably due to improper diet. Children and young adults are more liable to be attacked, and males suffer more frequently than females. Adults of a stout habit of body are prone to suffer. In India, boils are most frequent during the summer and the rains, and especially during the mango season. A vitiated state of blood is a cause of boils, and they are of frequent occurrence during convalescence from various diseases, and during exhaustive fevers. In cases of saccharine urine, and in persons whose occupation exposes them to foul emanations, boils are common. The most frequent seats of boils are the face, the back of the neck, and the gluteal region. They sometimes follow irritating applications to the skin.

Symptoms.—Boils appear either singly or in succession, or in crops. At first there is pain and slight itching, which are soon followed by the formation of a red and tense pimple, sometimes presenting a minute vesicle; in its centre a hair may be detected. The pimple increases in size and becomes acutely painful. It finally suppurates and the pain becomes throbbing in character. The skin gives way, more or less pus escapes, and the core or the central shred of cellular tissue becomes detached. In favorable cases the swelling subsides and healing takes place, leaving a scar or depression. When the inflammation affects chiefly the cellular tissue, the swelling becomes doughy, more round, and distinctly limited and may even fluctuate like an abscess. Such boils are commonly met with in the armpits and gluteal regions. Where the swelling is more diffuse, there is no core at the surface, but a hard painful pimple remains for a long time. In some cases there are groups of boils, appearing in successive crops. In the cachectic and debilitated they sometimes end in gangrene. In ordinary cases the constitutional disturbance is slight or absent, but in nervous and irritable persons boils often cause great distress.

Carbuncular boil of the face.—This rare disease begins as a small boil, generally on the lip, but sometimes on the back of the head and neck. It is mild at first, but in a short time it sets up inflammation of the veins and lymphatics in the neighbourhood, and causes poisoning of the blood. After pain or uneasiness for a day or two, rigors occur, and soon become violent and repeated. The swelling now becomes boggy, either black or violet in colour, and is surrounded by hard and brawny tissue; suppuration ceases and sloughs form. The face becomes swollen and puffy; the eyes project from their sockets; restlessness, anxiety, and dyspnœa supervene, and delirium and coma are noticed in some cases. The progress is extremely rapid and death takes place in three or four days.

Diagnosis.—The facial carbuncular boil is often confounded with malignant pustule. In the latter there is a large vesicle surmounting a brownish eschar, and a ring of smaller vesicles round the larger one. A boil, whether simple or malignant, presents a cavity in its centre, and a slough composed of dead areolar tissue.

Prognosis.—In the case of boils this is always favorable unless the patients are exhausted by old age or fever.

Treatment.—The state of the general health should be improved by tonics, as quinine and iron, fresh air, good food, and exercise. The secretions should be kept free, and if necessary, a saline purge should be given. A little wine or brandy may be allowed if the pain is severe and the patient much debilitated. With regard to local treatment, a boil may sometimes be cut short by plucking out the hair of the inflamed follicle; other local treatment should be similar to that adopted in cases of carbuncles.

Blebs or Bullæ.—These are large vesicles, or elevations of the cuticle, containing serous fluid. This condition is best seen in cases of blisters, burns, and scalds, and in erysipelas, and pemphigus. It is due to the transudation of serous lymph between the rete mucosum and the horny cuticle. Blebs may occur as an idiopathic affection as in pemphigus, or may be symptomatic as in erysipelas. They are generally the result of low vitality of the integument as occurs in burns and scalds, carbuncle, chilblain, and prurigo, or under the influence of powerful irritants, as ammonia, cantharides, &c. Blebs vary in size from a pin's head to several inches in diameter. They may be single or numerous and aggregated or scattered. Their colour varies with their contents, which may be clear amber-coloured serum, or opaque pus, or red or purple liquid. The fluid is generally free, but sometimes it is held in a delicate network, a condition most common in blisters occurring in acute inflammations.

Treatment.—When a blister has fully formed the contents should be gradually evacuated by small punctures, and then dressed or dusted over with oxide of zinc, or violet powder, or Fuller's earth.

Chaps.—These are cracks or fissures of the skin, in places where the integument has become hardened by infiltration as seen in erythema of the hands, wrist, and face, chronic eczema, psoriasis, and lepra vulgaris. Chaps are often seen on the hands in cold weather.

Treatment.—The affected parts should be kept very clean and dry, and protected from the influence of the atmosphere. Such local applications as oxide of zinc, vaseline, or cold cream are generally sufficient.

Cheloma.—The words cheloid and keloid are sometimes used indiscriminately to mean one affection, but they differ altogether in origin and significance. The word cheloid means a tumour of the skin, the result of some overgrowth of the connective tissue, and may appear on many parts at the same time. It has received its name "crabs' claws" from its throwing out spurs from its circumference. Keloid signifies a mark or blemish. It is due to fibrous degeneration of the derma, and resembles a cicatrix. Another difference between them is that the cheloid is a disease ot the derma, whereas keloid affects the subcutaneous connective tissue and also the deeper parts. Cheloid is characterised by the gradual development of a round, oval, or oblong tubercle, or firm nodule on the skin. It sends out processes which contract and cause puckerings in the skin round the central mass. The tubercles may be single or multiple, and when numerous and seated at short distances from one another, they often become connected by cords of the same structure, thus constituting dumb-bell, club-shaped, cylindrical, and square-shaped cheloma. They are most often seated on the sternum, which they cross transversely. There are two forms, idiopathic and traumatic, and both are connected with a diathesis. There is at first defect in the general nutrition, or of that of the skin alone, and as a consequence the power of resistance to injurious influences is less. The traumatic form develops in old scars from burns, or follows incisions or the use of stimulating liniments. It may also follow boils, leech-bites, strumous abscesses, or ulcers. Cheloid growths rarely cause any inconvenience beyond what is due to disfigurement. They are generally stationary and neither ulcerate nor desquamate; they sometimes disappear spontaneously. In some cases they give rise to itching or smarting.

Treatment.—Being a diathetic disease, surgical interference is of little avail, for the disease would probably reappear either in the wound or in the cicatrix. A spirituous solution of soap and iodide of potassium, locally applied, or mercurial or iodine plasters, aided by small doses of perchloride of mercury internally, have proved effectual in some cases. All irritant applications should be carefully avoided.

Chilblain.—It is an inflammation of a part of the skin excited by cold. The affection is common in children and young persons, and affects those in weak health rather than the strong and robust. It is more frequent in girls than in boys. Those of the lymphatic diathesis are most readily affected. The ordinary seats of this affection are the feet and hands. Occasionally chilblains appear on the ear and nose. They give rise to itching and tingling sensations, which become stronger on the application of heat or after exercise. The affection presents three marked degrees of severity. In the first, or the erythematous form, there is redness of the parts with swelling; the congested part is circular and somewhat tumid; it is bright red at first, but later on it becomes purple or livid in colour. In a majority of cases the affection goes no further; occasionally, however, the erythema advances into a bullous stage. Instead of simple tumidity a blister forms, due to effusion of serum beneath the cuticle. In the third stage the blister is ruptured, the surface becomes gangrenous, and there is some amount of ulceration and sloughing.

Treatment.—The main indication is to restore the circulation. This is best done by gentle friction, by rubbing the part, if severely chilled, with snow, and by keeping it wrapped in flannel or cotton-wool. The friction can be aided by the application of soothing liniments. After a time these may be replaced by stimulating applications, as camphor, turpentine, iodine, chloroform, or ammonia. Oxide of zinc and vaseline are very useful as a soothing application after the circulation is restored. If, notwithstanding every precaution, blisters form, they must be carefully opened, and the surface brushed with compound tincture of benzoin, or dressed with resin ointment or with the balsam of Peru. In every case the general health must be improved by tonics and nutritious diet.

Chloasma.—Chloasma signifies a green herb. It is a condition in which we find pigmentary discolourations known as liver-spots, which are yellowish brown, and occur in blotches. They are due to constitutional causes and are very often congenital. In some women during pregnancy and menstruation there is an extra deposit of pigment in the areolæ of the breasts and other parts.

Comedones.—The word literally means I consume. They present themselves as small cylindrical bodies or round black spots. They consist of sebaceous and epithelial substance accumulated in the follicles of the skin, and sometimes of hairs and even entozoa. Comedones are due to want of expulsory power of the skin, and to impediment in the apertures of the follicles to the exit of their contents. They are liable to occur in all parts of the body where sebaceous follicles exist, but are chiefly found in the face, neck, and shoulders. They vary in colour, figure, and consistence. When recent they are soft, white, and cylindrical, and when squeezed the contents appear as minute maggots or grubs with black heads. When of long standing, the comedones become hard, transparent, yellow, and bulbous. They often resemble acne punctata, the black spot on the summit of which is due to a comedo.

Treatment.—Good food and tonics are essential aids towards a cure. Locally, the weak state of the skin can be improved by frequent attention, by friction with pure soap and water and astringent lotions of perchloride of mercury, gr. ij to ℥j of emulsion of bitter almonds.

Condyloma.—These are fleshy outgrowths or excrescences, more or less hard, and sometimes wart-like. Their most common seats are the anus and organs of generation in both sexes. They may be simple cutaneous growths, but are generally of syphilitic origin, in which case they are otherwise termed mucous tubercles. Simple cutaneous growths are the result of irritation due to acrid vaginal or rectal discharges, or the natural secretions in dirty persons. Simple condylomata are smooth pendulous growths, but sometimes flattened and irregular, and, owing to their vascularity, are very subject to inflammation and ulceration. They are often painful in consequence of friction, and they may attain a considerable size.

Treatment.—The pendulous growths may be removed by the knife or scissors. To prevent any return the part must be kept as clean as possible and dry, and oxide of zinc or bismuth should be dusted over it. The daily application of the solution of subacetate of lead will generally cause even large condylomata to shrivel up and disappear. Syphilitic growths require calomel locally and constitutional treatment.

Corn or Clavus is a localised thickening of the epidermis, caused by irritation from friction, or from undue and intermittent pressure, as of tight shoes or boots. Its usual seat is the prominence of a joint, where the skin is subject to double pressure, or between the toes. The uniform thickening of the skin may be noticed on the heel in persons who walk barefooted, and on the palms of the hands, as in boatmen and many artisans. A corn consists of laminated epidermis, which is thick, hard, and horn-like. When cut into it is of a yellow colour, and the thickest part is found in the centre. In long-continued cases the pressure gives rise to a conical prominence, and frequently to an effusion of serum beneath it, whereby the skin is raised like a blister. The contents of such a blister may be either serum, blood, or sero-pus. In far-advanced cases the corn presents a central core, with smooth, laminated epidermis around. The core is made up of cup-shaped lamellæ, closely packed into one another. In old corns the most sensitive portion is the apex, which rests on the corium. Corns between the toes are generally white and soft, this condition being due to constant moisture. Such corns are known as soft corns, and in them effusion is most common.

Treatment.—The cause, namely, pressure and friction, should be removed, but, if this cannot be conveniently effected, attempts must be made to equalise the pressure, so that the corn may become callous all round. To prevent friction the corn should be covered with soap or lead plaster. If the growth is hard it should be pared with a sharp knife, and cut closely, but not so as to draw blood. As a preliminary the feet should be kept in hot water till the corn becomes soft, or a poultice may be applied. Sometimes the corn may be removed by scraping. Soft corns may be cured by applying nitrate of silver and placing cotton-wool between the toes. This treatment should be continued at intervals until a cure is effected.

DELHI SORE.—This affection is known under several synonyms. Some writers have named it Aleppo evil, others lupus endemicus, others mycosis cutis chronica, and others Oriental sore. The disease is very intractable. It begins as a papule, which may be either single or multiple, and gradually passes into an indolent and indurated sore. In advanced cases it looks like a fungous growth, and it often spreads by ulceration of the skin until large surfaces are involved. The disease can be reproduced by inoculation. Its chief seats are the exposed parts of the body, as the face, neck, and extremities. It is a very common disease in India, and affects dogs and horses as well as human beings. Its prevalence is due to defective sanitation. The poison is supposed to be located in the drinking-water. Bad food, insalubrious climate, and damp and malarious soils favour its production. In India the furuncular diseases are especially common in certain months of the year. During the hot and rainy seasons the vital powers are generally depressed, the blood is impure and impoverished, and the general nutrition is deranged. The skin participates in this condition, and death of minute portions of the areolar tissue is apt to take place. The dead portion or core is then removed by suppuration. Many observers have regarded these sores as a result of cell-growth connected with the hair and gland-follicles ; after ulceration and disintegration mycelium or other low forms of organism are often present, but it is uncertain whether they are the cause or only accidents of the disease. Others ascribe the disease to the action upon the skin of certain chemical constituents of hard water.

Symptoms.—The disease begins as a small reddish or pinkish papule, which gradually extends and soon desquamates. There is itching and pain in the part, and the papule becomes soft and boggy, and often semi-transparent. After a few days a vesicle appears, which bursts, leaving a crust, under which suppuration and ulceration go on. There is destruction of the true skin, and a sore is formed, which is either indolent or fungous looking. Healing takes place very slowly, and the sores often remain stationary for months. When on the face the cicatrices often give rise to great deformity, and in severe cases the general health invariably suffers.

Treatment.—Attention to hygiene and to sanitation are prophylactic measures of great importance. Cleanliness, pure drinking-water, good ventilation, and avoidance of contact with infected persons should be enjoined. Change of residence is desirable. The sore may be treated by the actual cautery or by disinfectants, as carbolic acid and iodine. The health must be improved by tonics and good nourishing diet, and the pain may be relieved by soothing applications. Locally, in advanced cases, black-wash or lotions of carbolate or sulphate of zinc, or of sulphate of copper, are to be recommended.

ECTHYMA (I burn out).—This affection is characterised by the eruption of prominent, isolated, large pustules, involving either the surface of the cutis or its deeper layers. The pustules are red, swollen, and surrounded by well-marked congested areolæ. Ecthyma often commences as vesicles (eczema) or as papules (lichen). In severe cases the pustules pass on to ulceration, and leave large adherent dark crusts behind.

Causes.—These are cachexia, debility, local irritants, as scabies in children and pediculi in adults ; the application of certain drugs, such as tartar emetic, and the internal administration of iodine and bromine.

Symptoms.—There is pain and sometimes fever. The pustules are rarely numerous ; they are matured in four or six days, and are most often seated on the extremities, chest, and throat, rarely on the face. They are hemispherical projections, and are generally rather larger than a pea. Their contents are liquid yellow pus, often mingled with blood. After a few days the contents dry up and form rounded scabs, which soon fall off, leaving red spots covered with new epidermis; but in severe cases the scabs remain for a long time, and then fall off, leaving hollow ulcers. Ecthyma is sometimes chronic, crops of pustules appearing at irregular intervals.

Diagnosis.—From furunculus: In the latter suppuration extends more deeply into the skin, and the cavity contains a small central slough. From impetigo: In this affection the pustules are small, and are accompanied with but little redness and inflammation.

Treatment.—Good food, tonics, and mild aperients are the best remedies, and if the ulcers be inflamed soothing lotions are needful. If indolent stimulant applications may be necessary.

ECZEMA (to bubble up) is a catarrhal inflammation of the superficial layer of the skin, with serous exudation on its free surface. It is characterised by vesicles seated on a moist surface more or less deprived of epidermis and covered with sero-purulent discharge. The discharge stiffens linen, and dries into a yellow, thin crust, and hence is regarded as an analogue to the catarrhal inflammation of mucous membranes. The disease is not contagious. It may be papular, vesicular, or pustular, and may be followed by incrustation, desquamation, thickening, and induration. It is always attended with redness, slight swelling, and burning heat, itching, and pain, and often runs a very prolonged course. It presents a series of pathological symptoms, and is remarkable for extremes in the degree of development and duration.

Causes.—The inflammation may be acute or chronic; it may occur at any period of life, and is sometimes hereditary. It is occasionally communicable to a nurse, owing to contact of her skin with the acrid secretion. It is common in gouty subjects. Direct irritation of the susceptible skin, as in (*a*) miliaria rubra, (*b*) scabies, (*c*) excessive sweating, (*d*) heat and moisture gives rise to it. It is also the result of friction, of application of poultices or of irritants, as stimulating lotions. It is sometimes due to the action of the sun's rays and to other causes producing hyperæmia, especially in places where the tissue of the skin is weak. In these latter cases it is often seen on the legs. Disturbance of nervous function, by interfering with the nutrition and circulation in the skin, may be a cause of eczema. Malassimilation and feeble digestion, aided by some local irritant, are the most common causes of this disease.

Varieties.—1. *Eczema simplex, or erythematosum.*—In it the prevailing symptom is redness. It is generally localised, and consists of crowded vesicles on a red base; drops form, but often the skin does not give way. When the vesicles burst, the fluid dries into a thin crust, covering a moist surface. 2. *Eczema papulosum.*—There is hyperæmia of the skin with congestion of the follicles, which become elevated in the form of pimples. 3. *Eczema vesiculosum.*—There is moderate swelling and serous effusion beneath the horny cuticle, giving rise to small vesicles. This form closely resembles E. simplex. 4. *Eczema rubrum* is a severe inflammation of the skin. The exudation is excessive, and is poured forth like a catarrh. It detaches the epidermis completely, and leaves the red corium beneath, which presents bright-red patches of variable sizes. It generally occurs on the legs and in the flexures of joints. The affected parts are hot, swollen, tender, itchy, and excoriated. 5. *Eczema crustaceum.*—In this the exuded secretion rapidly dries and forms crusts. 6. *Eczema impetiginodes*, or *pustulosum*, is characterised by a free formation of pus, a free discharge, and a yellow crust. It is common in strumous subjects, and chiefly attacks the head. The inflammation is severe; the exuded material is tough; the pustules are intermingled with vesicles and papules, and the scales are thick and dark. It resembles impetigo. 7. *Eczema squamosum*, otherwise known as *psoriasis palmaris*, occurs on the palms of the hands and soles of the feet; the cuticle, on account of interstitial exudation, is thick, hard, fissured, and dry. 8. *Eczema capitis.*—This form may extend to the external meatus. In it there is free discharge, the hairs are glued together, and crusts form. 9. *Eczema intertrigo* occurs where opposed surfaces are in contact, *e. g.* under the mammæ and in the hollows of joints. 10. *Eczema marginatum* spreads in patches, has a well-defined, raised border, and is met with on the inside of the thighs, armpits, and perinæum. It is a very inveterate complaint, as the affected skin is constantly exposed to friction. It is of frequent occurrence in babes and young children, and a frequent attendant on pregnancy and lactation. It is produced by local irritation, and is often met with in men who ride much. With regard to the prominent symptoms, itching is the most common in the dry forms, as in E. papulosum, E. erythematosum, and E. desquamatum. The itching is relieved when exudation takes place. In the moist forms there is severe pain and aching.

Diagnosis from lichen, strophulus, or herpes. Eczema is vesicular, while lichen is papular, with pimples on an inflamed surface. Strophulus is a kind of lichen in children. Herpes has a tendency to spread, and the patches generally follow the course of nerves.

Prognosis.—In eczema the prognosis is, on the whole, favorable, but it depends upon the health of the individual and the cause. The disease is often chronic and tedious, and frequently causes great nervous irritability and distress, owing to the itching it produces. Where eczema is complicated with dyspepsia, gout, or rheumatism the prognosis is less favorable and will depend upon the constitution of the individual. Chronic eczema is an indication of want of vital power or of bad health. It is often associated with disorders of internal organs, and chiefly with disease of the kidneys.

Treatment.—The treatment must, as a rule, be constitutional as well as local; but in chronic cases relief is often obtained by local aid alone. Any constitutional dyscrasia must be properly attended to; digestion and assimilation should be promoted, and the powers of the system restored. Sluggish action of the stomach and bowels must be relieved by saline purgatives and bitter infusions. Quinine, iron, and nitro-muriatic acid, also strychnia, cinchona, and dilute sulphuric acid may be given to assist digestion. If nervous irritability is great, bromide of potassium or bromide of ammonium is likely to be serviceable. If there be a gouty taint, colchicum, blue pill, and diuretics are indicated. Various preparations of arsenic are very useful after any constitutional derangements have been attended to. Arsenic acts both as a nervine tonic and promoter of assimilation. It should be given in small doses three times a day, after each meal. Liquor arsenicalis and the hydrochloric solution (two to three minims) are the best preparations in such cases, and they may be combined with vinum ferri or with cinchona. In children, cod-liver oil with arsenic is very valuable. If itching is very severe strychnia does good. Any local irritation must be removed, and in the acute form the local treatment must be of a soothing character. In the chronic stage stimulant applications are generally required. As soothing remedies, benzoated zinc ointment, starch-powder, or Fuller's earth may be tried. These form a coating over the inflamed skin and protect it from the action of the atmosphere. In chronic cases, mercurial ointment and tar ointment are useful. The distressing itching may be relieved by oxide of zinc, or Fuller's earth suspended in lime-water, and great benefit is often obtained from the use of tar, soap, and alcohol, made into a lotion. When crusts form, they must be removed by means of oil and poultices, and the part well cleansed with soap and hot water. White precipitate ointment, or solution or baths of corrosive sublimate, are often very successful in chronic cases. If the excoriated surface be large, carron-oil liniment is the best application, and collodion is very useful when a new healthy cuticle is forming. Friction of the clothes should be prevented, and scratching must be checked as much as possible. In chronic cases, if there is infiltration and œdema, the parts should be well rubbed from time to time with soft soap till the skin has become soft, or water dressing may be applied. In infiltration without excoriation, citrine ointment is a good application. Where the epidermis is much thickened, blisters may be tried, followed by dressing of zinc ointment. In E. capitis in children the hair should be cut short, and oil and poultices applied till the crusts are removed. The parts should then be dressed with ointment of benzoic acid and oxide of zinc combined. Tar is also of great value. In eczema of the nostrils, citrine ointment and solution of nitrate of silver, applied with a brush, may be recommended. In eczema of the legs, perfect rest, tar ointment, and bandages, if the veins are varicose, constitute the best treatment. In eczema of the scrotum or labia the parts should be painted with nitrate of silver. In most cases a lotion of borax and glycerine also does good. In E. intertrigo, the surface should be dusted over with powder of zinc or of starch and Fuller's earth. In all cases of eczema, the treatment, when decided on, should be perseveringly carried out.

Elephantiasis Arabum, Barbadoes leg (Bucemia tropica), is mainly an endemic disease of tropical climates, and more especially of India, Egypt, and Arabia. It occurs chiefly in localities within the influence of the sea air.

Causes.—The disease affects both sexes and all ages, but very young children and aged persons are seldom attacked. The strong and robust, the thin and debilitated are equally subject to it. The heredity of the affection is doubtful. It is characterised by progressive hypertrophy of the integument and of the connective tissue of the lower extremities, penis, and scrotum, and is frequently attended with swelling of the lymphatic glands and enlargement and dilatation of the lymphatics. In some cases it is associated with chyloserous urine and the presence in the blood of certain parasites. Its occurrence is said to be influenced by long residence in warm, malarious, and damp localities, especially near the sea-coast, and by the long-continued use of an exclusively fish diet. The parts affected are hard, and the skin and connective tissue increased in their natural elements. There is also superficial redness and general infiltration by the deposit of albuminous fluid in the cells of the areolar tissue. The surface of the skin is rugose and resembles in appearance an elephant's leg. The feet and toes are hidden by the growth, the superficial veins and lymphatics share in the enlargement and are cord-like, red, and painful. The exudation gives rise to a soft and fluctuating swelling, which on incision yields a large quantity of yellow or pinkish fluid, very closely resembling chyle, and which soon coagulates. Elephantiasis is a non-contagious disease. It is characterised by frequent recurrences of more or less severe febrile paroxysms, and other symptoms of impoverished nutrition are generally present. In chronic cases the skin becomes warty, papular, or studded with nodular elevations, and sometimes it ulcerates. It may desquamate, or become thick and horny, as in ichthyosis, or may remain congested and livid. Where the scrotum is affected, the growth attains a large size and is often accompanied by large hydroceles. Such tumours may weigh even 100 lbs. Elephantiasis scroti sets in with high fever, severe lumbar pain extending into the groin, and to the spermatic cords and testes. There is swelling of these parts due to effusion into the areolar tissue. In the case of the legs, the skin presents dilated and turgid lymphatic vessels, the swelling is very tense and painful, and is attended with febrile phenomena. The areolar tissue contains a quantity of effused fluid.

In some cases the skin discharges a serous ichor or chyle-like fluid; occasionally the surface temporarily assumes a herpetic condition and exudes an offensive serous or acrid discharge. In some patients there is very little constitutional disturbance, and even the recurrences of febrile paroxysms are few and far between. The pain is sometimes insignificant, the patients complaining only of the inconvenience and discomfort from the growth. In another class of cases the suffering is intense, the fever recurs at very short intervals and exhausts the patients. The appetite becomes impaired, the health suffers, the spirits are depressed, and the patient becomes cachectic and debilitated. Various internal complications connected with the liver and spleen are sometimes noticed, and albuminuria is occasionally present. There is yet another class of cases where the growth, after having attained a certain size, remains quiescent. The febrile paroxysms and other signs of constitutional disturbance abate or cease. If the growth does subsequently increase, the progress is slow and insidious. As a rule the febrile recurrences are noticed once or twice a month when the part becomes tense, hot, swollen, and painful, and often discharges offensive acrid fluid.

Treatment.—The growth is a local manifestation of a constitutional disorder, and malarious influences generally play an important part in its production. Constitutional treatment is, however, of little avail. Quinine, iron, arsenic, and iodine have been tried, but without any decided advantage. Fever may be subdued and the pain and restlessness relieved by salines, salicylate of soda, and opium. Locally, the application of iodide of lead and of biniodide of mercury has been found useful in some cases. Ligature and digital compression of the main artery have both been tried, but without effect. A change to a mountainous district or removal from the endemic area has in recent cases arrested the course of the disease. The scrotal tumour has often been removed with complete success. In the case of the leg, it should be kept evenly and firmly bandaged, or supported by an elastic stocking. Scabs and crusts may be removed by cataplasms and ointments. Every endeavour should be made to improve the general health and to place the patient under the most favorable hygienic conditions.

EPIPHYTA.—The word signifies "upon a plant," and refers to plant-like organisms found on the skin and mucous membranes. These are known as vegetable parasites, and include various forms of tinea and aphthæ. The *Achorion Schoenleinii* is a mass of vegetable fungus occurring in the crusts of favus. Another form is known as trichophyton, which is found in the epidermis and substance of the hair. The microsporon is another fungus met with in phytosis versicolor.

There are three principal features to be noticed in connection with epiphytic skin diseases. These are (1) soil; (2) the parasite; (3) effects. The *soil* most favorable for the disease is the skin of young children whose nutrition and assimilation are defective, and who present signs of scrofula. The *parasite* consists of cellular bodies known as conidia or spores, each of which has an outer covering of cellulose; liquid contents with granules enclosed in an inner membrane called the utricle; and, lastly, mycelia. Various names are given to the fungi, according to the contour of the spores. Where these are round the disease is known as tinea tonsurans; when oval as favus; where the cellular bodies or conidia are arranged in rows or massed in groups the epiphyte is known as T. versicolor. The filaments or mycelial threads vary in appearance. They may be fine, thin threads, or large, distinct, double-walled tubes. The presence of the fungi leads to irritation and inflammation of the skin. They spread in all directions equally from a given centre, and hence the eruption is for the most part circular. The fungi exist most abundantly at the circumference. The parasites have a tendency to invade the epithelial tissue, the hair-follicles, and the hairs; these latter become dry, twisted, brittle, thick, and opaque. The separate varieties of tinea will be subsequently described.

Treatment.—Cleanliness is the chief item of treatment. The patient should be well nourished, the power of assimilation improved, and locally the various parasiticides applied deeply to the very root of the affection.

Erythema.—The term signifies rose rash, and includes *E. simplex*, *E. intertrigo*, and *E. multiforme*. It is a superficial but active congestion of the skin, non-infectious, and characterised by redness and slight swelling. The redness disappears on pressure by the finger, and returns when the pressure is removed. It varies from a bright rose to a dark bluish-red tint, and the affected part is hotter than natural. It may appear in spots or diffused, or as wheals. It often spreads and is frequently erratic, and is attended with slight burning or itching. After the disease disappears the skin assumes its normal colour, or remains slightly pigmented and desquamates. The eruption is attended with fever and a slight rise of temperature. Erythema may be idiopathic or symptomatic. A few cases of the latter kind have been noticed after the use of arsenic, belladonna, hydrate of chloral, copaiba, cubebs, digitalis, the iodides, opium, quinine, salicylate of soda, strychnia, and turpentine. In *erythema simplex* there is slight but well-defined swelling and redness of the skin. It is excited by local acrid and poisonous irritants, by parasites, and also by tension from dropsy, by friction from underclothing, and by exposure to heat or cold. In chicken-pox, enteric fever, cholera, and rheumatic fever, there is sometimes a diffused erythema, but mostly of an ephemeral form. In infants, as a result of the irritation of worms and of teething, erythema often appears and disappears in a few hours. In smallpox it frequently appears on the second day on the face, and thence spreads. It lasts from twelve to thirty-six hours, and disappears, when the true smallpox eruption is developed. Another form of erythema is sometimes noticed in cases of smallpox where, on the second or the third day, a red patch of a triangular form, with the base upwards, appears in the region below the umbilicus. Where such patches appear the area of redness is free from subsequent smallpox pustules, and the cases often end fatally. *E. intertrigo* is produced by the rubbing together of two folds of skin, as occurs in the breasts in women, in the armpits and groins, and between the scrotum and thighs. It is caused by the irritation of the secretions. It may also be produced by constant flow from the nostrils, or of saliva, or tears, or of urine, as in vesical fistula.

Idiopathic erythema includes *E. multiforme* and *E. nodosum*. *E. nodosum* is often associated with rheumatism. It is distinguished by its localisation. In it the swelling and effusions form nodules, and hence the epithet applied to it. This form sets in with the development of prominent oval blotches on the skin in front of the lower extremities and trunk, and these soon become knotty from effusion; they vary in size from that of a pea to that of a walnut; they are painful on pressure, and are attended with fever. They terminate in desquamation. The swelling is due to an infiltration, accompanied by extravasation of blood. It has a boggy feel in the centre, and is of a light or pale red colour at first, but soon becomes dark red, then changes into blue, and fades into yellow, like a bruise or contusion. Fresh crops often succeed each other in different parts of the limbs and trunk. The complaint is common in girls, and is often associated with inflammation of the lymphatics. There is very little itching or tendency to the formation of vesicles, as in eczema. *E. nodosum* is often followed by pigmentation. The disease generally subsides in from two to four weeks, and desquamation follows.

In *E. multiforme* there are distinct patches of inflammation, and the eruption is often symmetrical on both sides of the body, its most common seat being the backs of the hands and dorsal surfaces of the feet. In some cases it extends upwards to the shoulders and hips.

Varieties.—These are named after the shape of the eruption; thus, *E. papulatum*, *E. circinatum*, *E. iris*, *E. marginatum* or *gyratum*. 1. *E. papulatum* presents small, flat, circular elevations of the cutis, attended with itching. They vary in size from that of a pea to that of a bean, and are of a dark-blue or brown-red colour. At first they are surrounded by red areolæ, which soon disappear. This is the mildest form of E. multiforme. 2. *E. circinatum* or *annulare* is an advanced stage of *E. papulatum*. In this the erythema increases at the periphery, forming a congested tumid swelling or red ring, the central part becoming flattened and pale. 3. *E. iris* consists of several concentric circular elevations separated by healthy skin between them. These rings may be constituted by small papules. They frequently break up, and form irregular and tortuous ringlets. The affection is most commonly seated on the back of the hands and wrists, and on the calves and ankles. It is often associated with gout and rheumatism. 4. *E. marginatum* or *gyratum*. In this form, the elevations coalescing, the circles enlarge and form large patches or segments of circles, each patch having a tendency to subside in the centre, and to extend towards the margin, where congestion is prominent. At any of these stages the eruption may disappear. It often occurs in crops, and lasts from four to ten days, ending in slight pigmentation and desquamation. Vesicles sometimes appear on the surface of the patches.

Diagnosis.—Erythema resembles roseola, urticaria, and pityriasis. They all consist in a slight, superficial, and short-lived inflammation, and end in scurf-like desquamation. They are never contagious. In erythema there is uniform redness of the affected portion of the skin; the affection runs a distinct course, and ends in pigmentation and desquamation. In roseola the redness is variously figured, and is of a rose colour. In urticaria the wheals always form part of the eruption. In pityriasis there is copious desquamation of the cuticle.

Treatment.—Soothing remedies, as lotio plumbi, and in erythema intertrigo dusting with flour, oxide of zinc, or other absorbents are the best applications. In E. nodosum, warm poultices of chamomile flowers and poppy-head fomentations give relief. Aperients and diaphoretics are useful to relieve fever, and tonics may be afterwards given. Any existing diathesis will require appropriate treatment.

Favus (a honeycomb). It is otherwise known as tinea favosa.—The affection is sometimes contracted from mice, and is found upon the scalp, rarely on other parts of the body. The poor are more subject to it than others. It is a kind of fungus, which by its presence irritates the part with which it comes in contact. These parasites have a tendency to spread and attack the hair-follicles. The hair-forming apparatus is destroyed by their presence and the hair falls out. The fungus is known as *Achorion Schoenleinii*, and consists of nucleated conidia, which are free, or jointed, or constricted; and filaments, which are large and tortuous, and contain granules and spores. The growth forms light, sulphur-coloured circular crusts, penetrated by hairs in their centres. They first appear as minute opaque spots beneath the epidermis. The favi may be discrete or crowded into a mass. In well-marked cases there is redness and swelling of the affected part, ending in baldness.

Treatment.—The health must be improved by tonics, good food, and cod-liver oil. Locally, the parts should be poulticed and then dressed with sulphurous acid lotion (one to three or four of water), followed by iodide of sulphur ointment.

FRECKLES.—These are pigmentary discolourations of the skin. They resemble a lentil in colour, figure, and size. The colour varies from yellow to brown or black. The chief seat is the exposed parts, as the skin of the face, neck, and hands.

FURFUR or DANDRUFF.—It is a bran-like desquamation of the skin met with in several diseases as pityriasis, psoriasis, and ichthyosis.

GLOSSY SKIN.—This affection has been met with in cases of partial division of the nerves of the forearm, and consists in a peculiar atrophic condition of the skin of the hands. The skin is thin, smooth, shining, and without furrows, and redder than natural. The condition may exist in patches or be uniformly diffused, the skin appearing as if stretched over the subjacent parts. In some cases the skin is fissured and even denuded of epidermis in places. The secretion of the skin of the affected part may be increased or altered in quality. The condition is attended with itching or pain.

GRUTUM.—These are miliary or pearly-white globules met with on the eyelids, cheeks, and temples. They are hard to the feel and resemble oatmeal grits, and hence called grutum. In size and roundness they also resemble millet-seeds, and are hence named milium or miliary tubercles.

HERPES.—It is a circumscribed inflammation and affects the most superficial layers of the skin, which are elevated by exudation. The disease is characterised by a group or patch of distinct vesicles situated on an inflamed base. Their contents soon become milky, they dry up, and form scabs, which leave only a reddish stain behind. Their chief cause is irritation of sensory nerves. The predisposing cause is the gouty or rheumatic diathesis. An eruption is often excited by chills, or by irritation, as of the air-passages, which gives rise to herpes labialis. Irritation of the urinary passages causes herpes preputialis. The vesicles generally follow the course of distribution of nerves, and in such cases there is a good deal of smarting pain, tension, and fever. Herpes may be general or local. The general form is rare and begins with fever, followed by eruption on the inside of the mouth and throat. The localised form is common on the lips, prepuce, and along the course of the intercostal nerves. The affection has received different names according to its form, seat, and appearance. Thus, *herpes zoster*, likewise called *zona* and *shingles*, is made up of several patches distributed along the course of one or more intercostal nerves, thus forming a half belt or circle round the waist. The eruption has a regular course, often extending to twenty days. It is unilateral, and the vesicles appear in groups consisting often of as many as twenty. Each vesicle is transparent at first, but soon becomes opaque, purulent, and sometimes purplish. In severe cases it ends in a dark-coloured scab leaving a permanent cicatrix. Herpes is associated with a morbid condition of the cerebro-spinal nerves; neuralgic pains or burning tingling sensations precede the eruptions.

With regard to the other forms of the affection, *herpes preputialis* and *herpes labialis* differ from *H. zoster*, in that in the two former there is only one inflamed patch, while in the latter there may be any number, varying in size from a small blotch to three or four inches. *H. labialis* is a common accompaniment of catarrhal affections and pneumonia. It is not unilateral, as is *herpes zoster*. *Herpes iris* is characterised by a vesicle with surrounding concentric rings of herpes; the vesicle is of the colour of a fading bruise. The eruption is generally seated on the backs of the hands, wrists, and knees. *Herpes circinatus* forms a ring of vesicles with a central portion in a healthy condition. This variety has been called hydroa, and the same term has been applied to the bullous eruption produced by iodide of potassium.

Diagnosis.—Herpes and pemphigus are sometimes confounded with one another. Both are vesicular, and have a close affinity with *erythema multiforme*. They may develop upon erythematous patches, and, like different forms of erythema, may be circinate, gyrate, or marginate. All these varieties represent the same affection in successive stages.

Treatment.—Soothing ointments or poultices should be applied, and followed by absorbents, as oxide of zinc or lime-water. The eruption must be protected from friction by covering the part with cotton wool. In ordinary cases no internal treatment is required, as the eruption runs a regular course and disappears spontaneously. The chief object is to improve digestion and assimilation and nervous power. If neuralgia be present quinine should be given, and injections of morphia hypodermically may be required to relieve the pain.

Horns.—They are morbid growths due to hypertrophy of the horny product of the skin, and consist of epithelial layers and sebaceous matter. They are generally single, and sometimes attain a considerable size. They are most commonly seated on the scalp, face, glans penis, and glans clitoridis. They are laminated and often curved or twisted, and the shaft is smaller than the base. In shape they resemble the beak of a bird or the horn of a goat, and they contain inspissated products of the follicles of the skin. These products, when exposed to the air, become dry, hard, and transparent. At first the growth protrudes through the aperture of the follicle, which, either from atrophy or ulceration, becomes dilated, and gradually fresh products are poured out and desiccated, thus making a fresh addition to the base. Another kind of horn is supposed to be the product of hypertrophy of the papillæ. It closely resembles a wart, and examples are found on the glans penis and clitoridis.

Treatment.—Softening of the horn and its disintegration by moisture are the chief objects to be attained by treatment. To effect these the horn may be kept under a waterproof covering or poultice, and it will gradually become detached at its base. The follicular bed may then be cleared by a scoop, when the sac will contract and close. A solution of chloride of zinc or of sulphate of copper will often serve to soften and remove the growth. Some apply potassa fusa. Where the case is very obstinate recourse must be had to the knife.

Impetigo.—The word signifies an outbreak with violence, and is used to designate an eruption of pustular vesicles with but little redness or inflammation of the skin, as occurs in ecthyma. The disease is superficial, and may be regarded as a pustular variety of eczema. In this complaint the nutrition and sensibility of the skin are altered, and the patients are generally weakly. Impetigo is not ordinarily contagious, but it is sometimes epidemic, though mostly sporadic. It attacks children as a rule. It is a vesicle containing pus or muco-purulent fluid, which is seated between the cutis vera and the epidermis, or between the epidermis and the rete mucosum. The pustule varies in size from that of a mustard-seed to a quarter of an inch in diameter. It is round or oval and superficial; it has no hard base, as in ecthyma, and is not painful. When small it often occupies the aperture of a follicle. Its contents vary from a bright yellow to a colourless fluid. After a time the secretion dries up and forms crusts, yellowish in colour, thick, and darker than those of eczema; when removed the surface underneath is either red or eroded, and bathed in thin purulent fluid. When healed they leave no cicatrices behind. Each spot runs a definite course, and lasts for a week or ten days. It is called *impetigo sparsa* when the pustules come out singly, and are isolated and distributed more or less generally, and *impetigo figurata* when they form groups or congregations of pustules. One form is known as *impetigo contagiosa;* it occurs in children on the face, mouth, nostrils, and ears, and often spreads through a whole family or neighbourhood. The pustules dry up into light yellow crusts. When the complaint is associated with eczema and abundant it is called *impetigo larvalis* or *porrigo larvalis.*

Treatment.—The disease is curable, and disappears completely if the health and nutrition be improved. The digestion and assimilation should be attended to, and derangement of nutrition should be combated by cod-liver oil and by iron, quinine, arsenic, and nitro-muriatic acid. As to local remedies, in the early stage cooling lotions are useful. The scabs, when formed, should be removed by poultices, or by oil, or by soothing ointments. After removal, oxide of zinc or white precipitate ointment may be applied.

ICHTHYOSIS, or fish-skin disease.—This is characterised by the exfoliation of the skin in black, dried crusts, resembling dried mud, or in thin, glistening laminæ, like those of mica or bran. Some of the crusts are two or three lines in depth, and firmly adherent. In this complaint there is deficiency or absence of sebaceous secretion, of normal development and growth of the skin, and especially of the sebaceous follicles. The affection is sometimes congenital and often hereditary. Its degree depends upon various circumstances connected with food and cleanliness. As age advances the complaint becomes well marked. The surface of the skin of the hands, arms, elbows, and knees is dry, harsh, or rough, greyish, and wrinkled, and the epidermis comes off in flakes, which suggest the idea of the scales of a fish. The cuticle is more abundant than natural, and in some cases the papillæ are enlarged and elongated. There is no fat in the subcutaneous tissue, and the sebaceous glands are filled with dried-up secretion and *débris.* The whole skin is starved. The scales are formed of hypertrophied skin and enlarged papillæ, or of cuticular scurf mixed with sebum. They are pulverulent upon the inner side of the limbs, and on the neck and front of the trunk; or angular, as in the neighbourhood of the joints. The skin is not clear and transparent. It has lost its lustre, and often exhales an unpleasant odour. The patients are feeble and emaciated and often liable to eczema and impetigo. A similar condition sometimes occurs in the course of chronic and wasting diseases, as phthisis, and in advanced years. Where the most conspicuous symptom is dryness of the skin the complaint is known as xeroderma.

Treatment.—The affection is almost incurable. Attention must be paid to the improvement of the nutrition of the body, and this is best effected by nervine tonics, as arsenic, and by nutritious food, cod-liver oil, and iron. Turkish baths and shampooing are useful to remove the scales. Frequent ablutions are essential. Free oiling, and rubbing the part with glycerine or butter of cacao or neat's-foot oil, give relief.

INTERTRIGO.—It is an inflammation of the skin, occurring in the hollows of the joints and between folds of the integument where the two surfaces lie together. The skin is sensitive in these parts, and moisture and retained secretion are associated with the friction. Heat and pressure much assist in the causation of intertrigo. The condition is often aggravated by irritant discharges, such as urine or fæces. The affection occurs at all ages, but in infants the abundance and delicacy of the integument greatly favour its production. In corpulent persons it is especially common, and those likewise who are emaciated and subject to eczema are prone to its attack. The parts most often affected are the perinæum, from the anus behind to the groin in front; the axilla, the grooves beneath the mammæ, and the flexures of joints, &c. Intertrigo is a kind of erythema, which has a tendency to run on to exudation, giving rise to muco-purulent discharge, and ending in excoriations and cracks. The disease is very inveterate, but can generally be cured.

Treatment.—Very little can be gained by constitutional treatment, as the disease is, as a rule, purely local. The part should be kept thoroughly clean and dry; the cause should be removed, and further mischief avoided by careful ablutions with soap. The part should be dressed with oleate of zinc or with fuller's earth. Lime-water mixed with oxide of zinc is very useful. Where the exudation is great zinc ointment or the white precipitate ointment should be applied.

KERION. — It is a pustular eruption of the skin affecting the follicles of the scalp. There are one or several blotches of a deep red colour, slightly raised above the skin, and dotted over with yellow spots. These latter are the apertures of the follicles from which the hairs have been expelled, and a copious muco-purulent fluid exudes. It is called honeycomb because the secretion resembles honey, and the tumefied inflamed skin with its yellow spots looks like the comb. The affected skin generally becomes bald. Kerion is sometimes associated with Tinea capitis.

Lepra.—The word implies scaly white spots. It is an old term for psoriasis, and the disease oftener affects the extensor than the flexor side of the limbs. The nails suffer from lepra, but not the hairs. When the eruption disappears it leaves no cicatrices, but only a brownish-coloured tint. It is common in scrofulous children, and is not, as a rule, attended with itching; but when it affects the gouty and the aged it is often accompanied with severe itching. It consists of circular rings, and may be limited to certain parts or general. It often disappears in two or three weeks, but may persist for years. The affection is hereditary; it has a remarkable tendency to break out simultaneously in corresponding situations on both sides of the body.

Diagnosis.—From *eczema.* Both present scales, and are often attended with itching, but in *lepra* there is no exudation, and it is chiefly located on the extensors of the elbows and below the knees.

Treatment.—If the patient be dyspeptic stimulants and coffee must be avoided. Arsenic is often a specific in these cases. In gouty persons colchicum may be tried. Locally, oil and poultices, or vapour-baths; glycerine with oxide of zinc, or tar ointment may be used. In slight cases the eruption may be painted over with solution of corrosive sublimate. Some use wet sheets over the part with benefit. Vapour-baths or warm-baths followed by the free application of green soap and tar ointment are always serviceable.

Leprosy.—The term signifies roughness, and it was at first used to describe those diseases of the skin in which this characteristic is well marked Leprosy is a terrible disease, and was described by the Greeks as elephantiasis. In it all the tissues of the body are more or less implicated. As a specific disease of the blood it is endemic in many parts of the world, and is well known in India, China, Africa, the West Indies, &c. It is common in hot climates, but is almost unknown as an indigenous disease in Australia. It is not contagious, the attendants on the sick do not contract it, nor does sexual cohabitation impart it to the healthy. The disease, however, like cancer and tubercle, is undoubtedly transmissible from parent to offspring. It is characterised by the development of nodules upon the skin, mucous membranes, and nerves, and by altered sensibility of the parts affected. The nodules give rise to pain, numbness, anæsthesia, or paralysis. They also diminish or even destroy the nutrition of the affected parts, and lead to ulceration, mortification, or gangrene. The natives of India look upon the malady as a punishment from God, and as such regard it with great awe and superstition. It has a close pathological relation to syphilis. The disease is more prevalent amongst the poor and badly-fed or badly-clothed than among the well-to-do and cleanly. This difference is due to the fact that improper diet leads to debility and predisposes to the invasion of a miasm. Some attribute the complaint to bad drainage, to defective cultivation of the soil, to the use of decomposing fish, and to the exhalations from freshly opened soil of marshes. The Banias and Hindoos (Brahmins), who are pure vegetarians and never eat fish, are not exempt from it. Its occasional appearance in Australia and the Sandwich Islands shows that it may be capable of development under specially favorable circumstances. A specific form of bacillus has been found in leprosy, the infection being supposed to be carried through the lymphatics. It is generally a disease of adult life.

Symptoms.—The onset of the disease may be so mild and so unobtrusive that the patient may suffer for some time without any special symptoms. At the beginning there may be discovered on close observation depression of nervous energy and feebleness of general circulation and of nutrition. The patient complains of languor, lassitude, depression of spirits, and of failing appetite and drowsiness. These symptoms continue for several months, and more or less resemble those produced by malarious poison. After a time two main symptoms manifest themselves, and when they set in they mark the onset of true leprosy. These symptoms are hyperæmia of the skin and defective sensibility of the peripheral branches of the spinal nerves. The hyperæmia of the skin appears in the form of circular spots of uniform size, or as scattered livid blotches of irregular shape and extent, which after remaining for a few days or weeks fade or disappear, to be followed by fresh crops. These isolated spots are most commonly found on the trunk and fleshy parts of the limbs. Those which are uniformly diffused are met with on the face, neck, hands, and feet. The blotches are tender, irregular, and elevated, and vary in size from a few lines to one or two inches in diameter. The spots gradually increase in number and deepen in colour, and are of a dull coppery or purplish tint, which on subsiding leaves a pigmentary stain behind. The skin so affected resembles the rind of an orange; it is puffy with serous infiltration, the follicles are hypertrophied and the pores dilated. At a more advanced stage the skin is slightly depressed in the centre of the patch, while at the periphery the disease extends, and the circular spot is thus developed into a ring. Finally the pigment disappears from the centre of the blotch, which then presents a deeply pigmented and slightly tumid belt. Where the blotches are colourless the patch is known as white leprosy, but where the exudation is red only or melasmic the affection is known as macular leprosy. The distribution of these maculæ or blotches corresponds to that of the subcutaneous nerves. Thus, on the face, the superciliary regions, the nose, and the ears are affected. On the arms, the parts supplied by the ulnar nerve are the seats of the disease. In all these cases there is a certain degree of numbness, as is best noticed in the case of the ulnar nerve. In the early stage of the disease there is scarcely any pain, but if the nerve be pressed against the bone acute pain is produced. Owing to imperfect innervation the fingers are benumbed, they are brown from pigmentation, and owing to defective nutrition of the abductor the metacarpal space between the thumb and the forefinger is hollow.

Leprosy begins with the above-mentioned symptoms, but after a time has a tendency to pursue an irregular course. Sometimes the affection is mainly confined to the nervous system, and there is loss of sensation; it is then recognised as *anæsthetic leprosy.* If the skin and mucous membrane are affected together it is called *tuberous leprosy.* Another variety of leprosy is known as *leprosa mutilans.* In this form there is anæsthetic leprosy associated with dislocation and amputation of the members at the joints. In tuberous leprosy the chief symptom is a gradual growth of solid papules or nodules on the skin, attached by broad bases, and often coalescing with each other. They are hard, of a reddish or brown colour, and somewhat translucent, and they do not appear until after the disease has existed for some time. They grow with the exacerbations of the leprous fever, and remain stationary during the intervals. There is very little pain connected with them. After a time, having become mature, they undergo degeneration and softening, and these changes are often owing to some external irritation, or to the action of the air. They thus become excoriated and ulcerated, and the ulcers discharge for a while, and then heal. The cutaneous glands situated upon these nodules disappear; the hairs become thin, dry, and lose their colour. The tubercles are chiefly seated on the limbs and face, and on the latter they attack by preference the nose, lobes of the ears, lips, and eyelids or eyebrows. The presence of the nodules on the face impart to it a morose or frowning expression. The disease often extends from the skin to the mucous membrane, and nodules appear in the mouth and larynx and give rise to severe symptoms. The voice is hoarse, the nose is clogged; sometimes there is ulceration of the septum, and the nasal bones fall in. When it affects the eyelids the cornea becomes opaque, the conjunctivæ inflamed, and sometimes the eyeball is destroyed. In the case of the ear the external part is enlarged and studded with tubercles. The limbs or the trunk are considerably affected, and ulceration is a prominent feature. It is not always preceded by the formation of tubercles, but occasionally swelling first appears, and is followed after a time by small blebs or blisters, from which the skin is soon rubbed off and ulcers form. In such cases there is no pain, and sometimes not even any knowledge of the occurrence. Very often the bone is exposed, and may even fall off; the ulcer then contracts, and the wound heals. This process occurs especially in the great toe and the thumb, and lasts for weeks or months; the disease is also prone to attack the phalanges of the feet and hands. These morbid processes are subject to periodic recurrences.

The anæsthetic variety is marked by disorder of the nervous system. In it there is impairment of general sensibility of the affected skin, or there may be increased sensibility at some points or parts and numbness at others. Sometimes those parts which for a time were anæsthetic become highly sensitive. There are always some premonitory symptoms, viz. hyperæmic spots, which may form several scattered blotches, or occupy a large area of skin, and are accompanied by pigmentary maculæ. Where the motor nerves become affected trembling or jerkings, or even paralysis and wasting of the limbs occur. There is absence of tubercles and of ulceration, and the numbness and anæsthesia are more marked. There is a state of general atrophy associated with great exhaustion, and neuralgic pains are prominent symptoms. A sense of dulness and heat and tingling, pricking, and burning are felt from time to time. The skin may be insensible, while there are deep-seated pains in the bones or joints, or the vertebral column. They are worse at night, causing restlessness and sleeplessness. The skin being anæsthetic, it is more prone to the formation of bullæ, and even to excoriations and ulcerations. In extreme cases even the contact of fire causes no sensation. Death is due to complications, as phthisis, dysentery, or kidney disease, or to asthenia.

Another variety is known as *leprosa mutilans.* This affection is more local in character; it is anæsthetic in its nature, but affects chiefly the limbs. In it the loss of the bones of the hands and feet is a prominent symptom, and the parts may be lost without pain. The phalanges, the metacarpal and metatarsal bones are affected, and the hand and foot may appear like a confused bunch of tips of fingers and toes. In these cases the skin heals up after separation of the bones, but in the tuberous form, where the skin or the mucous membrane is so extensively damaged reparation is far less likely. In the pure anæsthetic variety, the nervous system being implicated, repair is equally uncommon. White leprosy or leucoderma is a variety of anæsthetic leprosy. The patient is often dyspeptic. It begins as a small discoloured point on some exposed part of the skin, chiefly of the neck, and then extends and forms patches. The scattered patches sooner or later coalesce, and thus in some cases the whole body may become affected.

Pathology of leprosy.—There is proliferation of the connective-tissue corpuscles; the affected tissues are infiltrated with giant-cells, and they contain very few blood-vessels and very little blood. The tubercular variety generally invades the skin round the hair-follicles and glands, which are ultimately destroyed. In the anæsthetic variety the nerves are chiefly implicated; they swell and become firm owing to the proliferation of cells of the connective tissue, and often undergo degeneration. In leprosy the morbid changes are confined to the skin and to the nervous system; the sheaths of the cutaneous nerves are thickened and distended with exudation products. Similar morbid changes are found in the spinal cord, and various internal organs, glands, and viscera are found to contain tubercular matter. In syphilitic gummata and in lupus and glanders the same pathological elements are found. In all there is granulation tissue, which has a tendency to degeneration and softening. In leprosy amyloid or lardaceous degeneration is very common, and affects the alimentary canal, liver, spleen, and kidneys. It is always associated with extreme marasmus.

Prognosis.—This is always unfavorable, for the disease spreads and causes great disfigurement of the body. In the tuberous form there is tendency to continuous degeneration and softening of the skin and mucous membranes, with general marasmus and periodical exacerbations. The duration of life is said to range from ten to twenty years.

Treatment.—The patient must be removed from a locality where the disease is endemic to one where it is unknown; the skin must be protected from the injurious influences of air and accidents, and the strength should be maintained by tonics and by generous diet of animal food, and by active exercise. Tonics and nutritive remedies, as cod-liver oil, iron, strychnia, vegetable bitters, and phosphates are likely to be useful. Specific remedies and various alterative medicines, such as iodine, arsenic, and perchloride of mercury have been used largely, but without success. When given carefully and for a long time, and aided by generous diet, some relief may possibly be obtained. Among the natives of India *Hemidesmus indicus* (ananta mula), *Calotropis gigantea* (mudar), *Hydrocotyle Asiatica* (vallari), *Vernonia anthelmintica* (kalee zuree), *Gynocardia odorata* (chaulmugra oil), and *Dipterocarpus trinervis* (garjan ka tel) are highly prized and given internally. Various remedies are in local use in these cases. The skin may be stimulated by Turkish or hot-air baths, followed by friction and inunction, with bland almond, or salad-oil, or with stimulating oils, as gurjan oil and various others obtained from the Indian drugs already mentioned for internal use. In anæsthesic leprosy counter-irritation in the course of nerves and cupping and setons to the spine are recommended. In the tubercular variety the application to the tubercles of the acid nitrate of mercury or of potassa fusa, or any other caustic, is sometimes useful. Bhilva, the oil of the shell of cashew nut, is a useful vesicant for the tuberous skin. In leucoderma I have seen relief obtained by the application to the discoloured skin of an extract of fresh babchee seeds (*Psoralea corylifolia*), and by the internal administration of the same drug combined with arsenic. The patient should scrupulously avoid rich and highly-seasoned dishes, and alcoholic drinks. For dyspepsia and constipation infusion of rhubarb may be taken every three or four days. In several cases of white patches an oil expressed from the seeds of chaulmugra (*Gynocardia odorata*), and used both internally and as an external application, has proved of great benefit.

LICHEN.—It is a papular eruption of the skin, which is in a state of follicular inflammation. It is characterised by innumerable solid, colourless, or reddish nodules, or clusters of papules, each of the size of a mustard-seed, and attended with intense itching.

Varieties.—L. simplex is a mild form, which sometimes precedes the vesicular stage of eczema. *L. circumscriptus* or *circinatus* is characterised by small red papules, arranged in groups or segments of circles. The area is scaly and of a buff-pink colour. The sternum between the mammæ and the interscapular region are the most frequent seats of the eruption, which gives rise to severe itching. It is often symmetrically distributed on both sides. It terminates in desquamation. The affected skin is dry, thick, and muddy. When the hair-follicles are attacked the complaint resembles eczema. Other forms are *L. ruber* and *L. scrofulosorum.*

Treatment.—Purgatives are generally useful. In chronic cases Donovan's solution or quinine and arsenic may be given internally. Alkaline lotions often relieve the irritation. If the papillæ appear indolent absorbents are useful. In L. circinatus creasote ointment (♏x to ℥j of lard) may be applied. In lichen ruber arsenic internally and tar ointment locally are useful remedies. In L. scrofulosorum cod-liver oil should be given internally and also applied externally.

LUPUS.—This complaint is due to the infiltration of a neoplasm in the form of small round cells. The neoplasm undergoes degeneration, and thereby leads to atrophy, absorption, or ulceration.

LUPUS ERYTHEMATOSUS tends to the formation of indelible cicatrices. It commences with congestion of the capillaries of the skin and the development of a small-celled new growth. The seat of the growth is under the epidermis, round the orifices of the sebaceous and hair-follicles and the sweat-ducts. There is increased secretion of sebum. The normal tissue is destroyed by the formation of new growth, which undergoes partial fatty degeneration and absorption, leaving permanent connective tissue. Women are more liable to this complaint than men, and it is most common between twenty and thirty years of age. Weak persons are more predisposed than others. The affection is never hereditary. It most frequently appears on the cheeks, mouth, and fauces. The disease presents itself as small, well-defined patches, of a crimson or purple-red colour, and remains for a long time unaltered. After a time the patches become covered with thin, dirty-looking, adherent crusts, which on detachment leave a superficial whitish scar. Where both cheeks are attacked the eruption often extends across the nose. When it affects the scalp the hairs fall off and baldness results. It is not attended with any pain, and the itching is very slight. The disease is chronic, and may last for years, but never ends fatally.

LUPUS VULGARIS.—This form of lupus is a very chronic non-contagious disease of the skin and mucous membrane. In it there is infiltration of small round cells into their substance, giving rise to destructive ulceration. The disease commonly occurs in scrofulous persons with enlarged lymphatic glands, or with chronic suppurative diseases of the bones or joints. It occurs most frequently between the ages of ten and twenty. In lupus vulgaris the new growth resembles granulation tissue, and is highly vascular. Sometimes nodules are present, disseminated through the cutis, each consisting of one or more central giant-cells with numerous nuclei, and surrounded by smaller cells, thus resembling grey tubercles. Over these spots the epidermis is thick. The rete mucosum often degenerates into fat. The thickened tissue may become absorbed, leaving the skin unbroken, or disintegration may take place, and end in ulceration. Lupus vulgaris begins as a small reddish-brown patch, from the size of a pin's head to that of a split pea. It is sometimes slightly raised above the skin, in the form of a small tubercle, but sometimes it is on a level with it. The progress is very slow and tedious, and the disease exists in two forms. The non-ulcerative variety is otherwise called *lupus exfoliativus* or *lupus non-exedens*. It consists of small nodules, which are hard, tender, and bleed readily. They soon multiply and become tense, shining, and covered with detached epithelial scales. In favorable cases, after a time, the hardness subsides; the skin sinks and becomes firmly attached to the parts beneath, and is often changed into a white cicatrix. In *lupus exedens* the neoplasm softens, ulcerates, and becomes covered with greenish-yellow scabs, beneath which the ulcer extends. Removal of the scab leaves beneath it a granulating surface, presenting sharply-cut edges, and covered with pus. Ulceration extends and may attack the cartilage, fibrous tissue, muscles, and even bone. The mucous membrane may become attacked, and the larynx is especially liable to suffer from ulceration, partial destruction, or from warty growths. The disease is most prone to attack the skin of the face. *Lupus non-exedens* attacks the cheeks, and afterwards extends and affects the nose, ear, &c. *L. exedens* begins on the anterior portion of the nose, and rapidly extends. *Lupus impetiginosus* simulates impetigo. It is limited to the face, and consists of discrete tubercles, which suppurate acutely at their most prominent points, and are covered with dark, hard scars, which remain fixed for weeks or months. It has a tendency to cicatrise in the centre and spread at the edges, and is often associated with suppuration of scrofulous glands. This is a most destructive form of lupus; it begins on the alæ nasi, and is accompanied by a swelling and hyperæmia of the anterior part of the nose; it may begin in the septum of the nose, destroying that organ internally. Lupus often coexists with scrofula; enlargement of glands in the neck or axilla, with phthisis or chronic Bright's disease. The scars often lead to serious deformities, as ectropion, stricture of the nares, &c.

Diagnosis.—This disease is sometimes mistaken for psoriasis and eczema. In lupus the position and duration, the absence of scaliness and of itching, are marked features. Syphilis is distinguishable from lupus by the history, by traces of the disease in other parts of the body, the existence of syphilitic cicatrices in the mouth and pharynx, and by the results of treatment.

Treatment.—In cases of lupus erythematosus and lupus vulgaris the health must be improved, and the nutrition promoted by milk and cod-liver oil. The symptoms of scrofula require tonics, especially iodide of iron. The patient should have plenty of exercise in the open air. In the case of lupus erythematosus mild caustics are very useful. These include iodine paint, or the tincture applied until slight inflammation is set up. Soap liniment may be rubbed in, or the mercurial plaster applied in combination with spirits of turpentine. As soothing remedies benzoated oxide of zinc ointment, or the oleate of mercury, or even lead lotion, may be applied warm after the crusts have been removed. In lupus vulgaris the new growth should be removed by caustics, as acid nitrate of mercury, or nitrate of silver, or caustic potash. The acid nitrate of mercury should be applied with a glass brush. The solid nitrate of silver should be inserted into the solid tubercles or the ulcerated parts. The potash is painted over the ulcers and tubercles with a piece of sponge. Any one of these applications may be repeated after ten or fifteen days, during which interval crusts form and fall off. Their use is to be followed by poultices and by dressing of zinc ointment. Of late mechanical methods of treatment have been often adopted. Some advocate the actual or the galvanic cautery; others advise scarifications with a fine-bladed knife, thus causing obliteration of the blood-vessels and absorption of the lupus-tissue. Scraping and puncture are methods now in vogue. By scraping the new growth the products of secretion, the crusts, &c., are removed. The bleeding which follows the operation can be checked by ice, and the part should afterwards be dressed with carbolised oil or lead lotion. As the disease has a tendency to spread deeply into the skin the application of caustics after scraping has been recommended, in order to destroy the lupus-tissue which may have extended along the hair-follicles and the vascular structures. When, as often happens, the disease cicatrises in the centre and spreads at the edges, the caustic should be freely applied at the latter parts. Slight cases recover under mercurial plasters; others improve under tar-ointment.

MACULÆ.—The word signifies spot or stain, and is used to denote discolouration of some portion of the skin. There are four forms: pigmentary, hæmostatic, parasitic, and chemical. The macula syphilitica is a hyperæmia of the skin, with chronic discolouration. The pigmentary maculæ, or discolourations, are always located in the rete mucosum; those known as hæmostatic and hæmorrhagic discolourations are seated in the derma and subcutaneous tissues. Sunburn, freckles, liver-spot, bronze patches, and stains left after acne, lichen, syphilis, and lepra are examples of pigmentary maculæ; whereas the nævi resulting from permanent hyperæmia of the blood-vessels of the skin belong to the hæmostatic variety. The hæmorrhagic maculæ are found in purpura and bruises. The parasitic is met with in tinea versicolor, and the chemical are exemplified by the stains in the skin due to nitrate of silver.

MILIARIA, otherwise known as sudamina, is an inflammation of the sweat-follicles. The eruption is vesicular, and is associated with profuse sweating and fever. It is supposed to be due to the low vitality of the skin, the result of the great heat and profuse sweating. The eruption is common in hot weather, and occurs as red pimples, which are scattered on the surface of the body in the form of a rash. These then become vesicles, which contain at first clear fluid, as in eczema, but at an advanced period the fluid becomes milky and opaque or yellow and puriform. After a time the fluid dries up, leaving thin scales.

Treatment.—The fever must be subdued as far as possible, and cooling lotions and warm baths are useful as local remedies. After the bath the skin should be dusted over with fuller's earth, or sponged with lead lotion or oxide of zinc suspended in lime-water.

MOLE.—This signifies a certain outgrowth of the skin. Moles are generally congenital, and are known as mothers' marks. They may be either pigmentary or vascular. The pigmentary mole or macula is termed spilus. They may be removed by the application of a strong solution of potassa fusa ; under this treatment they dry up and seldom return.

MOLLUSCUM.—The term implies soft tumours of the skin. They are sometimes contagious. In one form of this affection the sebaceous glands and the parts around are enlarged and distended by an excessive quantity of sebum. The growths form little sessile tumours, which are umbilicated and disclose the distended openings of the gland-ducts. Recently molluscum has been described as a specific degeneration of the cells of the rete Malpighii. In size these growths vary from that of a millet-seed to that of an orange. On squeezing the sebaceous growth a white cheesy matter escapes. It appears mostly on the face, and is commonest in children. There is little or no pain or itching. Another variety is known as fibroma molluscum. This is an overgrowth of the areolar tissue. There is infiltration with serum, which renders these tumours soft. Sometimes small growths protrude from the surface of a large tumour. They are copiously supplied with vessels, and enlarged veins form a prominent feature of these growths.

Treatment.—Where the growth is of a small size it should be removed by means of scissors. Where the tumour is large the vessels should be secured by ligatures before removal. In *molluscum contagiosum* an opening should be made into the growth with a knife, and the contents squeezed out. The capsule will then contract and die.

MORPHŒA.—The term signifies a blotch, and is almost synonymous with vitiligo. It implies the formation in the skin of a white, wax-like, slightly elevated, opaque induration, which is surrounded by a dark-coloured ring of vessels ; it is a kind of fibroid degeneration, most prone to attack weak females ; it is a very rare affection, and runs a protracted course.

NAILS, DISEASES OF THE.—Affections of the nails may be divided into diseases of the nail proper and those of the soft parts in the immediate vicinity. The etiology of nail diseases is never obscure. Injuries from blows, or from undue pressure ; from splinters of wood, pins, &c., are of common occurrence, and their effects are intensified by the great sensitiveness of the tips of the fingers and toes, and the close adhesion of the nail to the deeper structures.

Syphilis, struma, psoriasis, eczema, and gout are the constitutional diseases with which onychia and paronychia are often associated.

Disorders of the nails proper give rise to changes in the colour, texture, figure, and development of the nails. There are also various parasitic affections connected with the nails. With regard to colour, stains in the derma are often visible through the nails, and are due to the development of psoriasis or syphilis. They may also be caused by effusion of blood or pus. With regard to texture, the nail substance may be hard or soft, thick or thin, brittle or flexible, and rough. A thick nail may be the result of (1) increased production of nail substance ; (2) arrest of nail-growth in length, causing a thick horizontal mass to be formed; in such cases the nails are often horny and twisted; (3) excessive quantity of cell-substance on the bed of the nail. Hardness of the nail is often associated with brittleness and the appearance of several cracks or longitudinal fissures, which in some cases are so deep as to reach the vascular corium. When the nail is soft it is also flexible, and in such cases the bed of the nail resembles epidermis rather than horn. It is usually smooth and polished on its surface, but sometimes it is rough and marked by grooves. The growth of the nail is impaired during illness, its horny matter is defectively formed, and grooves are produced across the nail. The figure of the nails varies. The broad, curved nail with club-shaped fingers is characteristic of struma. In other cases the nail is longitudinally contracted and prominent, and in others depressed or dish-shaped.

Diseases of the Connected Soft Parts.—The epidermis which borders the posterior wall of the nail is apt to come forward with the growth of the nail and become stretched as a thin film. It sometimes splits into narrow shreds; the laceration often extends into the corium, causing bleeding and pain and even inflammation.

Onychia is an affection in which the matrix becomes inflamed. The seat of the disease is the end of the finger and the soft parts surrounding and beneath the nail. The inflammation varies in extent and degree and also with the constitution of the individual. One variety is common in strumous and syphilitic subjects. In the ordinary non-specific form there is intense pain, redness, discharge of pus round the nail, ulceration of the matrix, and temporary loss of the nail. In the strumous variety there is considerable swelling, chronic suppuration and ulceration, associated with fungous vegetation. In the syphilitic form there is deep ulceration.

Onychomycosis.—In this condition the nails are thickened, rendered brittle, and raised from the bed by the growth of fungi. Often only one nail is affected. In psoriasis the nails of the hands and sometimes of the feet are affected. In this affection the nails at first are speckled, then become opaque, dull, uneven, and brittle, and split up into several layers, and there are patches of psoriasis about the body.

Paronychia.—This occurs in three forms: 1. As an acute inflammation of the walls of the nails. 2. As ingrowing toe-nail, in which case it is limited to one of the lateral walls of the nail, and is due to pressure against the border. 3. Chronic thickening and eversion of the nail.

Treatment.—This is both prophylactic and curative. Care and attention in the cutting of the nails is very important. They should be prevented from growing too long, but should not be cut too short, and the forward growth of the epidermis on the back of the nail should be checked. If onychia be present, any exciting cause should be removed. Any foreign body or the ingrowing nail which may have set up irritation should be carefully attended to. In the non-syphilitic affection the part should be kept at rest, the existing pressure removed, and cold dressings applied. If the pain be severe poultices will be required, and if an abscess has formed, as known by the shooting pain and a pale disc, it should be freely opened. The chronic inflammation may be treated by iodine paint, and should ulceration take place the wound may be dressed with benzoic acid and lard, or with the compound tincture of benzoin. For the ingrowing nail the body of the nail should be pared or scraped so as to lessen the force of the pressure. The toe should be kept in hot water till the nail becomes soft, and a probe or director passed beneath the border. A portion of the edge should then be carefully removed, and a piece of lint introduced beneath it. The fungous growth at the side can be easily removed by several applications of nitrate of lead. Sometimes removal of the diseased nail is required. In syphilitic or strumous cases special constitutional and local treatment is necessary. In the former, iodide of potassium and black wash are useful. In struma, cod-liver oil, iron, tonics, and nitrate of silver are the best remedies. Arsenic is useful if the disease is associated with eczema or psoriasis.

PEDICULUS.—There are three species of lice which infest man. These are, pediculus capitis, pediculus vestimenti, and pediculus pubis. These different species do not bite, but with their suckers they pierce the skin and draw blood, and thus they derive their food from the human body. Their presence in the body gives rise to a kind of skin disease known as phthiriasis. 1. *Pediculus capitis* affects the head, especially the occiput, and appears as a dark grey streak like scurf. It is found close to the roots of the hairs, and deposits its eggs on the shafts. The ovum is a small body, cup-shaped at its free end and firmly adherent by a short peduncle to the hair. The young are hatched in four or five days. The louse is about a line in length and presents a head, thorax, and abdomen. It has six well-developed legs armed with strong claws. It is of a dirty-white colour and is covered with short hairs. It causes intense itching and scabs often result from the scratching. The irritation often gives rise to enlargement of the superficial lymphatic glands in the neck. 2. *Pediculus vestimenti*, or body louse. This is larger than the *pediculi capitis*, which it otherwise closely resembles. It lies concealed in under-clothing, chiefly in woollen materials, and is often detected crawling upon the skin or the clothes. The ova are deposited on the wool and are hatched in five or six days. It gives rise to *phthiriasis corporis* and most often affects the old and feeble. It causes itching and small excoriations and scattered papules with slight bleeding due to scratching. Other forms of eruption resembling prurigo, lichen, urticaria or eczema are due to this parasite. 3. *Pediculus pubis.* It infests the hairs over the pubes and occasionally the axilla, and sets up great irritation. It is smaller and shorter than the others, and like a crab in shape.

Treatment.—Warm baths and parasiticides are effectual remedies. Decoction of staphisagria seeds, of asperag or nirbishi, or of seeds of *Cocculus indicus* (Kakmari) is useful. The crusts should be removed by oiling and poulticing, and the parts then dressed with a weak lotion of corrosive sublimate, oil of turpentine, white precipitate or creasote ointment.

PELLAGRA.—This cutaneous affection is characterised by erythematous patches which are seated on the most exposed parts of the body, as the back of the hands, neck, and breast. It is a disease of the tropics, and often seen in India. Being regarded as a local manifestation of sunstroke it is sometimes called *mal del sole.* The predisposition varies. There is often heredity, associated with bad food, bad living, malaria &c. It has been regarded as a fungus-disease, and unwholesome maize has been supposed to give rise to it. The immediate exciting cause is exposure to the sun's rays.

The affection sets in with congestion of the skin. There is at first an erythematous patch of a dark-red colour, but without any swelling; gradually it becomes more or less pigmented, the pigmentation commencing in the centre, and there is tingling and prickling pain. As the case advances the patch becomes benumbed and bleached in the centre. In the advanced stage exudation, vesication, pustulation, and incrustation take place. The disease is associated with various constitutional and nervous symptoms. There is great prostration of strength followed after a time by emaciation. The pulse is slow and feeble, and the digestion is deranged. The tongue is red, and there is nausea and vomiting and shifting or neuralgic pains in different parts. All these symptoms last with varying intensity for several weeks, when they subside to recur after fresh exposure. Confirmed cases generally end in dementia or melancholia. Very often such patients become thin and emaciated, the face is sallow and shrunken, the extremities cold; and serous effusion occurs in different serous cavities as the peritoneum or those of the cerebro-spinal system. Death may be due to exhaustion, to cerebral softening, to colliquative diarrhœa, &c.

Treatment.—Exposure to heat must be avoided and the general condition improved. Good nutritious diet and wine are essential. Various tonics as quinine, iron, and phosphates may be given from time to time, and any complication that arises should be combated. Locally, oxide of zinc with lime-water may be applied, and sometimes iodine paint does good. In chronic cases arsenic should be given internally.

PEMPHIGUS (a bladder) is an inflammation of the skin attended with large oval blebs or bullæ, scattered in greater or less number over different parts of the body and limbs. It has been regarded as a fully-developed stage of herpes iris or of herpes circinatus. It is sometimes associated with irregular patches of erythema, over which the vesicles, coalescing, form bullæ. The blebs are filled with clear serum or sero-purulent fluid. These burst, dry up, and form crusts, which finally separate and leave stains or maculæ, but no permanent scars. The disease is comparatively rare. It occurs in newborn children, and is generally syphilitic in character. It also occurs in adults, and females are more prone to it than males. It is non-contagious, and occurs during any season and in all climates. The fluid infiltrates the papillæ and the cells of the rete mucosum ; it then makes its way beneath the epidermis, giving rise to the formation of bullæ. Bacteria have been occasionally found in the fluid.

Pemphigus sometimes appears on the belly, back, and extremities, first in the form of red spots, which itch and burn considerably. In other cases the bullæ form on previously healthy skin ; they are hemispherical in shape, of various sizes, and contain an albuminous fluid with a little fat. The specific gravity is 1010, and the reaction is neutral at first ; later on it is alkaline. The vesicles burst, and in two or three days form yellow-brown or black crusts, which leave a purple stain behind. The bullæ often have a symmetrical distribution on both sides, and in some cases they are arranged in the form of circles or semicircles. They have a tendency to spread, and fresh crops are apt to appear at the edge of the crusts. The disease frequently appears in successive crops with varying intervals between them. Besides the skin the bullæ also form on the mucous membrane, as of the mouth, nose, and pharynx, and occasionally the bronchi and even the intestines are thus affected. In such cases bronchitis and diarrhœa are likely to occur. In well-marked cases the constitution often becomes seriously affected, and rigors and fever, with a temperature of 102° or 103°, with delirium and other cerebral symptoms, are present. Death, in such cases, may be due to marasmus or to some intercurrent disorder.

Pemphigus is met with in three forms: *acute*, *chronic*, and *foliaceous*. In the *acute* form the eruptions occur only once in life, and the duration is from three to six weeks. The symptoms resemble those of acute specific diseases, and recovery follows as a rule. In the *chronic* form the bullæ are numerous, and have a tendency to recur, and they sometimes assume a malignant form, in which the health suffers severely. *Pemphigus foliaceus* is extremely rare. It is characterised by the severity of the attack. The bullæ are scattered, and a few fresh ones appear round the central ones, and thus spread peripherically. The bullæ burst, but the skin does not heal over them, but remains moist and raw, and covered with crusts or scales.

Diagnosis.—In the early stage pemphigus is recognised with great difficulty if only a few bullæ have appeared. In advanced cases the difficulty is also great, as only a few stains are left. It is distinguished from scabies (bullous form) by the absence of cuniculi. The history of the case will help us in distinguishing the bullæ from those due to the use of blistering fluid, to burns, or to the friction of shoes, or clothes, or contiguous portions of skin. In herpes iris the seat of the bullæ is the back of the hands and feet; they run a rapid course, and have a circular or concentric form. In leprosy the bullæ coexist with maculæ and other phenomena. In old cases of pemphigus the skin is denuded of its epidermis, and the complaint may then resemble eczema, but in the former the patient is much emaciated, and there is dark staining of the skin, with absence of infiltration and little or no irritation or itching. Syphilitic pemphigus occurs in newborn children, and affects the palms and soles, and not the mucous membrane. Thick crusts form when the bullæ burst, and on their removal ulcers are left beneath. The children generally die.

Treatment.—In cases of pemphigus small doses of Donovan's solution, or of arsenic alone internally and zinc ointment, with a little calomel locally, constitute the best treatment. Arsenic is the only remedy that subdues the disease or prolongs the intervals between the recurrences. In all cases the patient's strength should be supported by quinine, iron, nourishing diet, and stimulants. Puncture of the bullæ and covering the denuded skin with oxide of zinc, boracic acid, or lead ointment, will sometimes be necessary. In mild cases dusting them with fuller's earth or with starch, will suffice. Where the bullæ are attended with considerable itching, tar ointment, bran poultices, or alkaline baths may be tried. In syphilitic cases baths containing corrosive sublimate should be prescribed.

DISORDERS OF PERSPIRATION.—These may be described under the following heads:—Anidrosis (absence of perspiration); dysidrosis (difficult perspiration); hyperidrosis (excess of perspiration); osmidrosis (foul secretion); chromidrosis (coloured secretion); and hæmatidrosis (bloody sweat).

Anidrosis.—The word signifies absence or want of perspiration, which is a symptom of various diseases, as diabetes insipidus and mellitus, and Bright's disease. This symptom is also common in the early stage of fever, and constant in ichthyosis, psoriasis, prurigo, and xeroderma. During winter the perspiration is generally scanty and the skin often rough and dry, especially in persons who habitually sweat very little.

Dysidrosis.—The word signifies difficulty of sweat. It is an inflammatory disorder of the sweat-follicles, and often mistaken for eczema. It is most common in summer, and in nervous and weakly persons who perspire most freely. It is best seen on the hands, especially on the palmar and interdigital surfaces. The condition gives rise to small vesicles filled with profuse sweat, which, being retained, fails to find its way outwards, and thus distends the sweat-ducts and glands. The contents of the vesicles are slightly acid at first, but soon change, and become alkaline. These vesicles often coalesce and form bullæ. Usually the cuticle becomes white and opaque, owing to the presence of the fluid beneath it; but after a time the skin peels off, leaving a dry red surface behind, and not a discharging one like eczema. The complaint is often attended with much itching and burning.

Treatment.— Nervine tonics and diuretics are very useful. Locally, soothing applications and astringent lotions will relieve the symptoms.

Hyperidrosis may be general or local. In a general form it occurs in the third stage of ague, in acute rheumatism, gout, phthisis, pyæmia, general debility, and from emotional causes, alcoholism, exposure to heat, &c. It is also common as a symptom of hectic fever. It follows the use of vapour baths, and may be brought on by nitric ether, jaborandi, opium, and antimonials. During convulsions, and during violent spasmodic pains, profuse perspiration often occurs.

Partial sweating usually occurs on one side of the body or of the face and head. This condition is often noticed in cases of hemiplegia, and during mastication in cases of suppurative parotitis and salivary fistula. The disease is sometimes hereditary. The sweating is often limited to the palms and soles, and may be constant and profuse. When the sweating is excessive it often gives rise to sudamina and miliaria, and even to severe eczema.

Treatment. — As the condition is due to defective nutrition, general tonics, as quinine, iron, and strychnia may be given; diluted sulphuric acid is also a good astringent tonic in such cases. Where excessive sweating is a symptom of phthisis or of hectic fever, oxide of zinc, or picrotoxine ($\frac{1}{60}$th of a grain), or hyoscyamus, or atropia ($\frac{1}{100}$th of a grain) may be given with benefit. Belladonna liniment does good in sweating of the hands and feet. In general sweating, flannel should always be worn next the skin and woollen stockings for the legs and feet. The skin should be sponged with hot water and with lotions of tannic acid or diluted sulphuric acid. The profuse sweating in rheumatism can be relieved by powdered talc or violet powder. Powdered dried ginger is a common remedy with the natives in India.

Osmidrosis.—In some persons the perspiration, if retained on the skin, exhales a very fœtid odour. The condition is most marked in the axillæ, groins, around the genitals, and in the feet. The odour is due to a kind of chemical change that takes place in the secretions from the sweat and sebaceous glands under the influence of moisture and the presence of macerated epithelium, the result being the formation of fatty acids.

Treatment.—Cleanliness is the chief measure for the cure of this affection. Repeated washing with carbolic soap, thorough drying, and frequent change of clothing are highly essential. The best local application is the oxide of zinc with rice starch. A solution of boracic acid has been tried with good results for profuse sweating of the feet. The patient's stockings should be dipped into a saturated solution, and then allowed to dry. Litharge ointment is another useful application. Tincture of belladonna may be given internally, and any disorder of the general health should be attended to.

PETECHIÆ.—The word signifies small crimson or purple spots of the skin. They are circular in form, and are developed round the openings of the hair-follicles. The capillaries of the follicles lose their contractile power, and there is exudation of the colouring matters of the blood into the adjacent tissues. These spots are of various colours, and fade away like a bruise. They are met with on the mucous membrane as well as on the skin. In purpura, scurvy, and in malignant fevers petechiæ are common. They are easily distinguished from hyperæmic spots by the latter disappearing under pressure, and from fleabites by the presence in these of a puncture in the centre. The petechial spots are of a deeper colour in the centre, and fade towards the circumference.

PHYTOSIS.—This is a group of cutaneous affections in which a fungous or parasitic growth is found on the skin. These fungi draw their nutrition from the juices of this tissue, producing and diffusing sporules, and thus propagating the disease. They infest the epidermis, the rete mucosum, the epithelium of the follicles, the nails, and the hairs. The most important species are *Tinea tonsurans*, *T. circinata*, *T. favosa*, and *T. versicolor; Lichen marginatus* and *Sycosis.*

Phytosis versicolor (*Pityriasis versicolor*). This is a disease of the epidermis, rete mucosum, and follicular epithelium. The cuticle has a mottled appearance. It is discoloured, and may be yellowish-brown or olive. The patches are small and irregular in shape, and are intermingled with blotches. If a portion of the exfoliated epidermis be minutely examined it is found to be made up of cells or fungous vegetations known as *microsporon.* The affection is due to defective nutrition of the skin or to general debility. The disease is generally seated on the trunk, but it may attack the neck, the upper arms, the flexures of the elbows and knees. The discolouration appears as if punctated by the apertures of the follicles, which are deeper coloured than the rest of the surface. The characteristic features of *Phytosis versicolor* are discolouration in patches, the exfoliation from the breaking up of the morbid skin, and considerable itching. It is often mistaken for pigmentary diseases, as melasma, chloasma, and pityriasis. In melasma there is discolouration, but the patches are smooth, while in phytosis there is slight elevation of the skin, which is also exfoliated, and the discolouration is often symmetrical.

Treatment.—Tonic remedies are indicated ; sulphuret of potassium ointment or a lotion of perchloride of mercury should be locally applied, and the part should be frequently cleansed with sulphur-soap.

PIGMENTARY DISEASES OF THE SKIN are those in which there is (1) excessive pigment; (2) defective pigment; (3) alteration of colour ; (4) colouring due to presence of foreign matters. 1. *Excessive pigment:* This condition is well illustrated by chloasma and melasma. In both there is an increase of the normal pigment of the skin. Chloasma is often associated with pregnancy, and the discolouration is of a brown or liver colour. 2. *Defect of colour:* This is best exemplified in albinism, where there is absence of pigment, both in the rete mucosum and hair; other examples are achroma and leucasmus. 3. *Alteration of colour* is seen in lentigo and ephelis, and is due to excess of one of the elements of pigment.

4. *Artificial colouring:* The continued use of salts of silver internally leads to a permanent leaden or slate-coloured hue. The seat of the discolouration is the papillary layer of the corium. In jaundice the discolouration is temporary, and is yellow or green. In the case of a bruise the discolouration varies from blue green to yellow, and passes off after a time.

Pigmentary diseases are due to defective nutrition of the skin; to hyperæmia of the skin, as in the case of varicose veins; and to deranged innervation, as in persons suffering from nervous shock and prurigo. Persons with delicate skins are most liable to suffer from these affections. Melasma on the face is a common result of exposure to bright sunlight. Discolouration often follows the use of a blister. In syphilis the copper-coloured stains are due to defective nutrition. Arsenic, when used for a long time, often leads to melasma. The discolouration round the orbit known as *Melasma palpebrarum* is common in hysterical girls and in nervous women, and it often occurs during the menstrual periods, and is increased in dysmenorrhœa. During pregnancy the areolæ round the nipples become darker. In Addison's disease the bronze discolouration of the skin is a prominent feature. The existence of any such discolourations usually indicates general debility or grave disorder of the general health.

The discolourations, when once established, are difficult to remove. Those due to constitutional disorders, as Addison's disease, syphilis, &c., require constitutional treatment. In the case of arsenic or silver the cessation of the use of the medicine is often followed by disappearance of the affection. As local applications, alkaline lotions, washes containing acetic or hydrochloric acids, iodine, and iodide of potassium, or perchloride of mercury in almond-emulsion, are all more or less serviceable. Friction is always useful in pigmentary discolourations.

PITYRIASIS is closely related to psoriasis and is characterised by branny desquamation of the epidermis. It may be the result of malnutrition of the skin, or of bad health, or of local irritation. It is often associated with heat, redness, dryness, and itching. It is a chronic inflammation of the skin without any swelling or exudation. The nutrition of the skin being defective, the inflammation ends in desquamation.

Pityriasis rubra is a very severe disease. It is one of the forms of dry eczema, and begins as a red scaly spot which rapidly spreads. Its seat is the face and scalp, which are more or less flushed and covered with silvery scales. The disease is common in children and appears as small circular red discs coated over with a fine furfur. It is sometimes found on the limbs and body.

Treatment.—Red oxide of mercury ointment and astringent applications are indicated. The nutrition of the skin may be improved by small doses of arsenic, iron, or phosphorus. The digestion should also be improved, and attention must be paid to diet and hygiene. Various nervine tonics, with cod-liver oil, are useful.

PRURIGO.—The term means itching, which is a symptom of various skin diseases. In prurigo proper itching is the most prominent, if not the only symptom. There is defective nutrition of the skin with irritability or excited state of nervous structures. It occurs in elderly persons in whom the nutrition is weakened or exhausted. In prurigo the itching varies in intensity. It generally resembles burning or gnawing of the flesh. The patients often complain of strange sensations as of animals creeping or crawling about the skin. To constitute a true prurigo several factors are necessary: 1. Old age. 2. Defective nutrition or ill-nourished skin. 3. Absence of cutaneous fat, dryness, hardness, and a wrinkled condition of the skin. 4. Extreme irritability of the nervous system leading to violent scratching with the finger-nails. 5. There is development of small hard papules on the surface of the skin which as a result of scratching are covered with black crusts of desiccated blood and marks of abrasions. Prurigo is often a local disease. When it affects the integument round the anus it is called *prurigo ani.* The disease is very annoying and often lasts for years when it attacks the clitoris. It is most obstinate. Prurigo is often confounded with phthiriasis. In prurigo the rash is primary, but secondary in phthiriasis. In prurigo the papules are the result of chronic inflammation in the papillary layer of the derma. The disease is often seated on the buttocks and on the sides of the limbs, and the papules are felt beneath the skin before they are clearly discernible by the eye.

Treatment.—The nutrition of the skin should be improved and the nervous system tranquillised. Generous diet, cod-liver oil and arsenic are the principal remedies. To subdue the irritation, the bromides, chloral hydrate, henbane, cannabis, and morphia may be used either separately or in various combinations. As local remedies, warm baths, followed by inunctions with vaseline, or the application of lotions containing borax and hydrocyanic acid will afford great relief.

PRURITUS, or itching, is a symptom which indicates hyperæsthesia, or an excited state of the nerves of the skin and of the most external parts of the mucous membranes. It is associated with eczema, lichen, prurigo, urticaria, scabies, and phthiriasis. In scabies and eczema the cause lies in the tissues of the skin; in urticaria the cause is in the nerves themselves. In prurigo there is neurosis leading to defective nutrition of the skin. Pruritus is an accompaniment of all skin diseases which affect the uppermost papillary layers of the cutis, in which lie the ends of sensory nerve-filaments. Pruritus is absent in those diseases, as syphilis and leprosy, which attack the lower layers. The causes of pruritus are numerous. When it arises without any eruption it may be due to imperfect elimination or the presence of certain substances in the blood as bile, urea, or uric acid, or to the use of certain medicines, as copaiba. It may be due to reflex irritation, to disorders of the uterus, stomach, or kidneys. It may be excited by local irritants, as pediculi, by scabies, pityriasis versicolor, tinea tonsurans, by worms about the anus, by flannel or rough clothing next the skin; or by unhealthy discharges as leucorrhœa, or saccharine urine. It may also be associated with inflammations of the skin as lichen, eczema, psoriasis, rashes from tartar emetic and croton-oil ointments. In pruritus the skin is often altered by the scratching. The papillæ and follicles become hyperæmic and prominent, and drops of blood exude and dry into crusts. The symptoms may be general or local, slight or severe, continuous or intermittent. It is generally worse at night. *P. senilis* occurs in old people, and is often due to pediculi. *P. ani* is connected with piles, eczema, or sweat secretion. In children it is due to worms. Pruritus of the genitals is most common during pregnancy, in women with granular os uteri, and at the change of life. Diabetic patients often suffer from pruritus of the genitals. *P. scroti* is due to want of cleanliness; itching, if increased by the warmth of the bed at night and attended with a pimply rash, is suggestive of scabies, and when about the shoulders and back, of phthiriasis. Itching is also suggestive of urticaria or winter pruritus if it suddenly comes and goes at night, and occurs about the thighs and legs.

Treatment.—Locally sedatives as opium with carbolic acid are useful for neurotic itching. Tar and sulphur are of great service where no cause can be found. A lotion of liq. carbonis deterg. ℥ss, glycerine ℥j, aquæ ℥x, or sulphur bath made up of potassii sulphidi ℥iv, hot water cong. xxx, is useful. When there are retained excreta aperients are indicated. Flannel should not be worn next the skin. Some recommend cyanide of potassium ointment as an application in these cases. When itching is unattended with excoriations, camphor chloral with cold cream is beneficial. Pruritus pudendi may be cured by extreme cleanliness, and with borax lotion, or nitrate of silver, or aconite ointment. Internally morphia, bromide of potassium, conium, strychnia, and also atropiæ sulphas are sometimes beneficial. In *P. ani*, calomel ointment is the best local application.

PSORIASIS is characterised by a hypertrophous growth of the epithelial layers of the skin, which becomes covered in patches with silvery-looking, white masses of scales on a red and hyperæmic base. On separating the scales a slightly excoriated surface is left beneath. Its most common seats are the elbows, knees, and head. It often appears at first as little spots (*P. punctata*), which, coalescing, form large patches (*P. guttata*); when of the size of a shilling it is called *P. circinata;* if serpentine, the patches are called *P. gyrata.* It is often mistaken for syphilitic disease of a similar appearance; but in the latter the eruption is limited to the palms and soles. The distinction between psoriasis and lepra is no longer upheld, and the two words are now regarded as synonymous. For further details the reader is therefore referred to the account of the latter disease as given in this chapter.

PURPURA is a cutaneous hæmorrhage, being characterised by the effusion of blood in limited areæ in the rete mucosum and the papillary layers of the cutis. The blood may also be found in the connective tissue, in the spaces between the hair-follicles and the ducts. Purpura is sometimes attended by hæmorrhages from the mucous surfaces and into serous cavities. Children are occasionally born with this complaint, but it may appear at any age, and in persons apparently in good health. It is often associated with constitutional disturbance, and occurs during the course of various diseases—as Bright's disease, valvular heart-disease, and cirrhosis of the liver. In cachectic persons, and those suffering from phthisis, acute rheumatism, ague, and leucocythemia, the disease sometimes occurs. Little is known as to its exciting causes; severe fright and sudden obstruction of the circulation, as in severe coughing and epilepsy, have been known to bring on hæmorrhagic or purpuric eruptions. Chloral hydrate in large doses, and even iodide of potassium, have produced similar results. The affection is due to defective nutrition of the coats of the blood-vessels, and to alterations in the blood itself. The coats being weak, we most often find purpuric eruptions on the legs and feet, and on the most dependent parts, as the back, if the patient is recumbent.

Symptoms.—Purpura sometimes appears in apparently healthy persons, and runs a definite course. The eruption has the same characters in all its forms. It exists as isolated reddish or purplish spots or patches, varying in size from that of pin points to several inches in circumference, and each having a rounded or irregular outline. The patches are at first bright red, then become darker, and fade into a light yellow; they ultimately disappear by absorption. They never end in desquamation. There is neither pain nor itching, and the spots are not removed by pressure. Fever often accompanies the disease. The small spots are known as petechiæ; the larger as ecchymoses; those which appear as broad stripes are termed vibices. The eruptions generally fade within a week. Similar effusions are often found beneath the mucous membrane in severe cases. In these parts, owing to the delicacy and slight resistance opposed by the membrane covering the capillaries, bleeding from the free surface is very common. Extensive extravasations are sometimes found in the cavities of the pleura, peritoneum, and pericardium, and rarely in the muscles, periosteum, and bones. Purpura presents four different varieties. (1) *Purpura simplex:* In it the spots are limited to the feet and legs, or in severe cases are scattered over the whole body. They appear in crops, each lasting for about a week. There is no fever, but only general malaise. (2) In the *rheumatic form* there is slight fever, with pains in the knees and ankles, and general stiffness and weariness. There are also more or less severe intestinal symptoms, such as diarrhœa, nausea, and vomiting. (3) In *purpura hæmorrhagica,* prostration often precedes or accompanies the eruptions. The complaint suddenly shows itself by the development of petechiæ over a large area of the skin, and of hæmorrhagic effusions beneath the mucous membrane of the lips, cheeks, and gums, and by copious hæmorrhages, as from the nose, mouth, kidneys, bowels, bladder, and urethra. Sometimes the loss of blood is so great as to imperil life. (4) *Symptomatic purpura:* The eruptions sometimes occur in the course of typhus fever, scarlet fever, measles, and smallpox. In the last-named the eruption comes out in the first three days, and precedes the special eruption. Such patients generally die from delirium and high fever.

Diagnosis.—The diagnosis is always very easy. In purpura the spots are not altered by pressure; there is no pain, no itching, no scaliness. From scurvy the disease is distinguished by the absence of the special history; by its occurrence in persons whose health may be good; by the absence of sponginess of the gums and painful swellings; moreover, the disease does not yield to fresh vegetables and lime-juice.

Treatment.—Rest is all-essential, and the digestion and assimilation should be improved by general tonics, as quinine and iron, and nourishing food of all kinds. Various astringents, such as ergot and gallic acid, are also indicated. When hæmorrhage takes place from the nose or bowels the application of ice and injections of iced water will be found serviceable. Turpentine in doses of fifteen minims is often an effectual hæmostatic in these cases.

Pustule.—This word signifies a vesicle containing pus, as in smallpox and ecthyma.

Pustule, Malignant.—This is a contagious specific disease, also known as contagious carbuncle or anthrax. The disease is communicated to man from horses, sheep, and horned cattle, in which it is known as splenic fever, and is due to the presence in the system of the *Bacillus anthracis.* It exists in two forms—local and general. The local variety is manifested by the existence of pustular or carbuncular phlegmonous swelling, attended with intense surrounding inflammatory œdema, and associated with lymphangitis. The constitutional symptoms may be slight or severe, and death is common. In the general form the poison gives rise to symptoms similar to those of splenic fever in animals. They are those of blood-poisoning without external swelling, and consist of extreme prostration, anxiety, congestion of the lungs, followed by death. In such cases the post-mortem examination reveals a pulpy and swollen condition of the spleen, hæmorrhagic extravasations in various organs, congested lungs, with diffuse cellular exudations. The poison is conveyed to man either by direct or indirect contagion. Woolsorters' disease is an instance of indirect contagion. Those whose work causes them to handle wool and hair—as woolpackers and sorters, felt-manufacturers, horsehair cleaners, furriers, and tanners—are prone to suffer. Direct contagion is rare, but butchers and slaughterers are sometimes thus affected. Eating the diseased flesh may occasionally propagate the complaint in man, but as a rule the poison is destroyed by cooking. In rare cases the poison has been conveyed through milk. In the case of woolsorters and others, the poison enters the system either by direct and local inoculation, or by inhalation of the dust containing it. The poison also becomes diffused by water, or by means of wool-waste and bone-dust used as manure. It would also appear that earth-worms may convey the poison from the buried carcasses to the surface, and distribute it on vegetation.

In the case of men and animals thus affected the bacillus may be detected under the microscope in the blood and tissues, either diffused or forming masses in the vessels and lymphatics. It consists of a motionless, short, straight or bent, or curved filament, and is apparently homogeneous. In length it is seldom less than $\frac{1}{2500}$th of an inch. The larger ones are made up of several short ones enclosed in an outer sheath. In their natural condition these filaments increase in length, and produce spores which are highly tenacious of life. The spore re-generates the bacillus rod, and keeps up the disease. The mode of multiplication is as follows: each rod is found to consist of a sheath containing central protoplasm. In ordinary cases the rod increases, the protoplasm divides into two, the outer sheath becomes constricted and divides, and this process is repeated in each segment. The bacillus requires for its growth the presence of nitrogenised material and a supply of oxygen. Its life becomes extinct at the temperature of 60° C., and it is also destroyed if decomposition sets in. Prolonged boiling also leads to its destruction. When dry the bacilli can be preserved for some time, and the spores remain in an active state for years and are unaffected by ordinary changes of climate or temperature.

When malignant pustule occurs as a primary cutaneous affection, due to direct inoculation, it is usually seen in the face, neck, or upper limb. Within a few hours or in two or three days after inoculation a small red pimple appears, either not painful or attended with burning and itching. In a short time a papule forms, with a vesicle or a bleb at its summit. This bursts and discharges a clear fluid, often blood-stained. Beneath the denuded surface is a black red spot which dries up, leaving a dark brown eschar on an indurated base. Soon this becomes surrounded by a narrow ring of vesicles and extensive œdema. The neighbouring lymphatics also become swollen. The patient seldom survives. The local symptoms are generally associated with constitutional disturbance as fever, but symptoms of blood-poisoning become especially marked. There is extreme prostration, great mental depression, cold sweats, sometimes diarrhœa, delirium, and coma. The patient soon becomes cyanotic. The duration varies from thirty or forty hours to five or six days. The rate of mortality is estimated to be one in three.

In the *internal* form there is no cutaneous lesion, and the symptoms more or less resemble those of pyæmia. There is shivering, vomiting, headache, extreme physical prostration, and mental depression, dyspnœa, and symptoms of collapse. Numbness of the extremities has also been observed. When the *lungs* are affected, the symptoms are those of broncho-pneumonia, with great prostration. In *intestinal* cases, the symptoms are vomiting, colicky pains, and diarrhœa. The prostration is also extreme, and is sometimes aggravated by bleeding from the mouth and throat. Glandular enlargement and subcutaneous infiltration in the neck are sometimes noticed.

Treatment.—It is both prophylactic and curative. In the early stage as soon as the vesicle has formed and the diagnosis is clear, free incision and cauterisation should at once be resorted to. The pimple should be cauterised by pure carbolic acid and then dressed with carbolised oil. Fuming nitric acid is also a useful cautery in such cases. The general treatment includes the free use of quinine, carbolic acid, and stimulants. The destruction of carcasses and hides and hairs of animals so diseased should be strictly carried out in order to prevent the spread of the disease. Thorough and systematic disinfection of buildings should also be practised.

Rash.—It is a sudden outbreak of extensive redness of the skin, otherwise known as exanthema. It is best illustrated in erythema (the red rash), roseola (rose rash), rubeola (crimson rash), scarlatina (scarlet red), purpura (purple rash), urticaria (nettle rash). The word "rash" conveys the idea of suddenness of appearance or development.

Ringworm.—This is a disease of the hair-follicles and hair, which spreads in the form of a ring. It is contagious, and may affect the unhairy parts, as the arm, neck, chest, and shoulders. It is a kind of chronic folliculitis with infiltration of the skin, the condition of the follicles being due to a depressed state of the general health; the follicular epithelium is in a state of degeneration. There is proliferation of the granular elements of the epithelial cells and of the hair-cells, resulting in a sort of phytiform growth, with a thickened disc and margin. According to another theory, ringworm is due to the presence of a fungus-plant which is propagated by sporules and conveyed from one person to another, the irritation giving rise to folliculitis. The disease is sporadic, and limited to the soil which is favorable for the development and growth of the sporules.

The contagion of ringworm resides in the sporules, and is communicated from one person to another by combs, brushes, sponges, &c., and even through the atmosphere. On the body the disease appears as red, slightly elevated rings. The patches vary from half an inch to an inch in diameter, and present a concentric arrangement. They give rise to severe itching. The base of the patch is papulated owing to the prominence of unhealthy follicles. It is also covered with branny desquamation. In ringworm of the scalp there is loss of hair in the affected patch, and each patch is rough owing to the hairs being broken at different lengths; other characters are the same as in ringworm of the body. In ringworm there is neither redness nor any inflammation as a general rule; but occasionally, and especially in strumous persons, the patch is surrounded by an inflammatory ring, or a border of small pustules. Under the microscope the epithelium of the follicles and of the hair contains a phytiform structure, consisting of mycelium and sporules. This fungus is known as *trichophyton*. Ringworm is characterised by the accumulation of numerous laminæ of epithelium within the follicles, and the cells and hairs are penetrated and filled with the mycelium and sporules of the fungus. In the shaft of the hair the plant is often seen in the form of rows of sporules.

Diagnosis.—Ringworm is often mistaken for dry eczema. The circular and oval discs, and the red rings on the non-hairy skin are characteristic of ringworm. In tinea of the scalp there are stumps of broken hairs, which are not seen in eczema, which is also a more chronic affection and rarely attacks the scalp alone, but is present in other parts of the body at the same time. Ringworm is a very troublesome affection and may last for years. It is kept up by defective hygiene and unsuitable food. In cases where the tinea finds a suitable soil it develops very freely and becomes inveterate; observations, however, point to its cure under favorable conditions if left alone.

Treatment.—The local treatment consists in removing the cause. The best local application is chrysophanic acid, diluted with vaseline, and aided by moderate friction. Iodide of sulphur ointment diluted with two-thirds of vaseline and applied night and morning, will also cure the disease. Nitric oxide of mercury ointment is equally efficacious and may be substituted for the iodide of sulphur ointment if this causes much irritation. The use of sulphurous acid and of solutions of the perchloride of mercury is also attended with good results. The general health must be improved in every possible way, and arsenic is useful internally.

RODENT ULCER is a kind of tumour. It begins as a small tubercle or pimple seated on the face, or side of the nose, or about the eye. This remains for a long time quiescent, but finally breaks and ulcerates, the ulcer being surrounded by hard edges, which are much undermined. It is classed among the epitheliomata. The chief characteristic of rodent ulcer is that ulceration follows the spread of the new growth. It resembles lupus in the diminution of the size of the part which takes place. It differs from epithelioma by the fact of its appearing early in life. In rodent ulcer there is no cachexia, the lymphatic glands are not involved, and the surface of the ulcer is clean. There is little or no pain, the disease is chronic, and the progress very slow. It may last for years without affecting the health. The appearance of the ulcer is characteristic. Its surface is glistening and of a pinkish hue, the margin slightly elevated and somewhat indurated. It is considerably undermined, and the discharge is thin and purulent. Capillary hæmorrhage frequently takes place, but severe bleeding is rare.

Treatment.—Free excision and the application of caustics, such as chloride of zinc, constitute the best treatment. If once removed the ulcer is not very liable to return.

ROSEOLA.—This is due to hyperæmia of the skin, which presents a rose or crimson colour. It is one of the exanthemata or rashes of the skin, and is also called rose rash. It is often due to feverish excitement, the result of heat and over-fatigue. It is frequently epidemic in India, and it is also symptomatic of acute fevers, variola, gout, cholera, rheumatism, vaccina, &c. As an idiopathic symptom it is common in children with deranged digestion. When general it resembles a mild form of measles, but rose rash is not contagious, is not attended with catarrh, the eruption is not crescentic, but often in rings, is more rosy and patchy in character. It is generally a punctated rash, more or less suffused, but sometimes it appears as small erythematous patches which spread and form rings.

Symptoms.—There is slight fever attended with languor and weariness, and often associated with redness of the mucous membrane of the mouth and fauces. Sometimes the glands in the neck and under the jaws are enlarged. The rash runs a course of four or five days and then disappears without any exfoliation of the epidermis. It begins upon the head, and then spreads downwards to the arms and legs.

Treatment.—Rest is essential. Effervescing salines and laxatives internally are indicated. Locally cooling applications to the skin, as vaseline, benzoated lard, or olive oil, will afford relief.

Rupia (dirt or filth).—It signifies crusts which result from the drying-up of purulent and other ichorous discharges over a foul syphilitic ulcer or sore. These crusts are also found in lupus. Syphilitic crusts are the result of flat, isolated bullæ, lasting longer than in pemphigus. They are often over half an inch in diameter, and contain a mixture of pus and blood. When the bullæ dry they produce dark, thick scales marked with concentric lines hiding destructive ulceration; the crusts often increase by additional discharge of pus and blood, which soon dries up. They are consequently thick, conical, and adherent, and more or less resemble oyster shells. The crusts found in lupus are harder, but not so large. They are concretions of epidermal substance, and not dried masses of morbid secretions. In the case of pemphigus the bullæ are the result of superficial or local disease. In rupia the bullæ are seated on a hard base, they slowly increase in size, and are surrounded by a halo of congestion. When the resulting scab is hard they are called *rupia simplex*, when conical, *rupia prominens*.

Treatment.—In both forms the treatment of the constitutional state is chiefly requisite. Iodide of potassium is useful in syphilitic cases. For lupus the syrup of the iodide of iron and cod-liver oil are the best remedies. It is better to avoid removing the crusts as they form a covering to the existing ulcers.

Scabies (scab) or itch is caused by the burrowing in the skin of the *Acarus scabiei* or itch-mite. It consists of an eruption due to the irritation, and to the scratching of the sufferer. The affection is contagious and readily transferred from one person to another. The animal or the parent acarus always resides at the distal end of the burrow, which has a dotted or beaded appearance, with ragged edges at its entrance. The burrows or their tortuous receptacles are called *cuniculi.* Acari at first cause scattered artificial eczema, or small white papules or vesicles, or even pustules and then penetrate the skin in straight, curved, or irregular lines. As they penetrate they deposit eggs in a linear series. The affection causes violent itching, especially at night and a subsequent hyperæmic rash. The extent and severity depend chiefly on the duration of the complaint. In cachectic subjects the vesicles and burrows generally suppurate. The secondary rash consists of papules or pustules, and resembles ecthyma or urticaria. Its most common seats are the soft skin between the fingers and toes, and on the flexor side of the wrists and elbows, the lower part of the abdomen and the buttocks. The parasite may also infest the nipples and the organs of generation, but the head and face are rarely affected. It generally attacks both sides symmetrically, and is most common in children. The itching gives rise to the formation of vesicles, which burst, and the fluid dries up and forms crusts. The discharge often contains eggs which, by coming in contact with any other part of the body, or with any other person, propagate the disease.

Treatment.—Locally, an ointment of sulphur ʒj to ℥j of lard or of iodide of potassium, should be freely applied to the skin. Sulphur-baths or lotions are also highly useful. The bath is made by dissolving sulphurated potash ℥j in four gallons of water. The treatment should be continued for a week or ten days. The long-continued use of sulphur ointment often causes an irritable state of the skin, and eczema and the itching from it may be mistaken for a continuation of scabies. Styrax ointment with a little iodide of potassium is also a very effectual application for scabies. In obstinate cases sulphur vapour-baths are the most efficacious means of curing the disease.

Sclerema Neonatorum.—It signifies hard or tense condition of the skin in infants. The disease is congenital, and is otherwise known as skin-bound disease. It has some connection with syphilis and is generally fatal. In this affection the subcutaneous tissue is infiltrated with a stiff stearine-like deposit. The lower limbs are pricipally affected, and the skin over them is glassy and of a yellowish or red colour. It is firm and hard to the touch, and the surface is cold. The infant is unable to move, and the features are fixed and staring. The respiration is affected, the circulation is feeble, and death follows in a few days.

SCLERODERMA in adults.—This condition of hard-bound skin is due to bad nutrition. It results from the development of white fibrous or fibro-cellular tissue, and from infiltration by coagulable fluid ; thus the more active and organised structures as the vessels, nerves, and muscles are pressed upon and lose their functional activity. The degenerated hard mass is almost bloodless and nerveless. The disease is most energetic in places where the white fibrous tissue is most abundant, as the skin and ligamentous structures of the fingers and joints. The new substance consists of cicatricial tissue, and has a marked tendency to contract. The disease may last for months or years, and women are more often affected than men. The skin is stiff at first, then becomes hard, rigid, white, contracted, and leather-like. The disease sometimes takes the form of bands, which may be raised and yellowish-looking. When on the face, the features are distorted, the eyelids drawn apart, and the neck is twisted. In other cases, the limbs are contracted to such an extent that even the bones may protrude through ulcerated openings. Scleroderma is believed by some to be of a neurotic origin. White, irregular, shining, or ivory-like blotches sometimes occur in the course of nerves. They are found on the neck, trunk, and limbs. When solitary they are known as morphœa.

Treatment. — The disease is incurable. The health must be improved by tonics, as quinine, iron, strychnia, phosphorus, and cod-liver oil. Electricity as a local stimulant has been tried with some benefit.

SEBORRHŒA, otherwise known as stearrhœa. It signifies an increase of the fatty secretion of the skin. In children it is sometimes due to want of cleanliness, but generally to an ill-nourished or debilitated condition of the skin. In this affection there is an excessive secretion of sebum from the sebaceous follicles and glands. The secretion is more or less oily and gives rise to a greasy skin. In other cases there is an incrustation of dry, fatty plates, or of greasy, dirty, white flat scales, which can be easily detached, exposing the slightly red and non-excoriated skin below. The secretion is generally colourless, but may be stained with bile pigments. The hairs generally fall off. The most common seat of this affection is the head and face. In elderly persons it is sometimes a precursor of epithelioma or of rodent ulcer.

Treatment.—Locally, the accumulated sebaceous secretion may be got rid of by soap and water, or by a lotion of lime-water with oxide of zinc and calamine. Where the concretions are firmly adherent to the skin the application of oil, vaseline, and poultices will have the effect of separating them. The state of the general health should be improved by tonics, arsenic, and cod-liver oil.

STROPHULUS, otherwise known as red gum, or tooth rash, is due to derangement of the bowels. It is a papular eruption of the character of lichen, and consists of papules, scattered or diffused, or collected in groups upon a reddened skin. It is due to hyperæmia of the papillæ, or to distension of sweat or sebaceous glands. It is common in infants, and the eruption is most often seated on the face and arms. It is said to be due to the child being kept very much wrapped up and over-heated, but there is generally some deranged condition of the stomach or bowels, and hence the name. There are no constitutional symptoms and the eruption often disappears without any treatment. When associated with dentition the rash is termed red gum. In an aggravated form it is apt to run into eczema.

Treatment.—The state of the general health must be attended to and the disordered condition of the stomach and bowels relieved by suitable medicines, such as rhubarb, magnesia, &c. Locally, lime-water and oxide of zinc are the best applications.

SUDAMINA.—This term signifies minute vesicles which are formed by the distension and rupture of the sudoriparous ducts, and escape of the sweat into the upper layer of the cuticle. In size they resemble a millet-seed, and when numerous they are known as *miliaria.* In this affection the sudoriparous or sweat-glands are the seat of a low form of inflammation or of congestion of their capillary blood-vessels. When subacute inflammation occurs it is known as hydroadenitis. Dysidrosis (already referred to) is the name given to the disorder in which there is mechanical impediment to the escape of the sweat.

SYCOSIS is an inflammation of the hair-follicles of the face, and particularly those of the beard and whiskers. The cutis about these follicles is inflamed, hyperæmic, and infiltrated, and is the seat of suppuration. The common form is due to exposure to cold, but any irritation of the hairs serves to keep up the disease. The seat of the pus-formation is the sub-epithelial surface of the true skin. The epithelium is in a state of softening and decay, and a fungus-growth is generally present. The affection is contagious, and may be propagated by shaving with dirty razors. Sycosis begins with a sense of burning heat, pain, and tension or stiffness, and the eruption consists of red, inflamed, more or less swollen and infiltrated nodules between the hairs of the beard. After a while pustules penetrated by a hair appear on the tops of the nodules. These burst, give exit to profuse discharge, and then dry up into brownish, prominent crusts. In strumous subjects it runs a chronic course, and in aggravated cases crops of pustules appear every few days for weeks or months. In such cases loss of hair results. The affection sometimes assumes a lupoid form.

Treatment.—In the early stage the treatment is palliative or soothing. Poppy fomentation, water dressing, and rice poultices will relieve the local heat and suffering. In the chronic form, attempts should be made to soften and remove scabs by rubbing with oil. During the night the affected part should be covered with a rag smeared with white precipitate ointment, or with zinc or calamine ointment. In chronic cases, iodide of sulphur ointment diluted with two-thirds vaseline, or the red oxide of mercury ointment should be applied every night. Constitutional treatment, if required, should be adapted to the circumstances of the case.

TINEA, or moth worm. These are vegetable parasitic diseases affecting the skin.

Varieties.—Tinea favosa or *favus* (already described); *T. tonsurans; T. kerion; T. circinata; T. sycosis*, and *T. versicolor.* The last five varieties are caused by the same favus.

Tinea tonsurans (ringworm) of the hairy scalp, or *herpes tondens* of old writers. It is caused by a fungus (*Trychophyton tonsurans*), which is a vegetable parasite affecting the epithelial tissue at the roots of the hairs close to the scalp. The disease is chronic, very contagious, and often epidemic in children. It appears in the form of circular scurfy patches, varying in size from that of a threepenny piece to several inches in diameter, and having a slightly raised surface, and the hairs over them are altered in structure. They are dry, lustreless, swollen, and brittle, broken off close to the scalp, and are surrounded by fungus-elements. Generally there is abundant formation of adherent scurf, which clings round the hair-follicles. The disease varies in appearance; the spots may be irregular, due to coalescence of two or more patches. In strumous subjects there may be pus at the seat of mischief, forming a crust with the hairs. The disease occurs in the hairy parts of the scalp, and may co-exist with an affection of the general surface and non-hairy parts (*T. circinata*), which may appear first, the hairs becoming subsequently affected. When tinea attacks the whiskers and moustachios it is known as *T. sycosis. T. tonsurans* is attended with itching. It is very inveterate, and may last for years.

Treatment.—The indications are three: To improve the condition of the affected part, so that the fungus-plant may find the nidus insufficient for its growth and development. This is best done by promoting nutrition by good food and hygiene, and by tonics, as quinine, iron, and cod-liver oil. Arsenic is also useful. To get rid of the fungus-plant, parasiticides are necessary, and in order that the drugs may act effectually the hair should be first carefully removed from and around the affected patches by means of a pair of scissors. The denuded patches now appear circular, darker than the surrounding skin, and scaly. Epilation is often practised with advantage, the hair being removed with pincers from the affected patch or patches. In many cases free blistering of the part with acetic acid or with acetum cantharidis may be tried with benefit. After the blisters the scabs fall off, and parasiticides may then be applied. The best of these are iodine paint, sulphur in any of its forms, mercurials, tar, creasote, and carbolic acid. Some use crysophanic acid, others croton-oil liniment, to excite pustulation round each patch. So long as the short, thick, and brittle hairs remain the disease is not cured. The hair should be washed every day with cooling lotions, or soothing applications followed by weak astringents. After a time the fungus very often burrows deep into the follicles, and therefore in recent cases the cure is more rapid than in old and chronic ones. I have found an excellent remedy in the juice or tincture of gujakuruna. Occasionally tinea tonsurans leaves the scalp bare and shining, and in a condition simulating *alopecia areata*. To promote the regrowth of the hair a wash composed of tincture of cantharides and rosemary will be found useful.

Tinea circinata, or ringworm of the surface. It occurs in small red patches, scaly, itchy, and circular in form. In the centre the patch is paler, and is the seat of branny desquamation. The fungus-plant commonly infests the forehead, neck, face, and chin. It often coexists with tinea tonsurans, as a result of extension, the growths in the two diseases being the same. During the hot season, and in persons who perspire profusely, tinea circinata or ringworm of the surface is very common. The patches present concentric rings separated by healthy skin; the margin of each patch is red, and covered with vesicles or pustules. Heat, perspiration, and want of cleanliness promote the development of the growth. The patches tend to spead over different regions of the body, the most common seat being the fork of the thighs. It is often met with as rings with papular or vesicular edges, desquamating in the centre, and patches of this kind are often seated on the buttocks, axilla, face, and chest. The disease is very common in India and China, where it is known as dhobie's or washerman's itch. It is especially prone to attack the debilitated, dyspeptic, and intemperate.

Treatment.—The disease is very obstinate, but generally yields to repeated applications of parasiticides. The affected part should first be cleaned and well rubbed, in order to remove the epidermal layers in which the fungus flourishes. Some recommend the application of mild vesicants, as acetic acid, over the patch ; others use blistering fluid, to be followed by parasiticides. In very obstinate cases a lotion of hyposulphite of soda (1 to 4 of water), or Goa powder mixed with vinegar, forms a good application.

Tinea kerion is a variety of T. tonsurans, in which the hair-follicles are much inflamed, and the patch looks prominent and discharges a puriform or an albuminous fluid. The patch is swollen and perforated with holes. The hairs lie loose in the follicles and often fall out. The affection is sometimes due to irritant applications to the scalp, by which the follicles are inflamed.

Treatment.—The pain should be alleviated by lead ointment and parasiticides applied. The hairs often fall off of themselves, and the fungus is detached with them. In these cases the mildest parasiticides will suffice, and epilation may be practised if necessary.

Tinea versicolor, or chloasma, or pityriasis versicolor is a parasitic disease common in adults. It has been already described under the head of phytosis versicolor.

TYLOSIS.—This is a cutaneous affection, consisting of thickening of the epidermis in parts exposed to great pressure or friction. In the feet tylosis occurs from the pressure of shoes ; on the hands by rowing, or by constant handling of implements or tools. A callous or laminated portion of epidermis, formed at a given point and pressing against the derma, causing pain, is called a corn.

Treatment.—Though causing inconvenience, tylosis gives rise to but little suffering. Every attempt should be made to remove the cause, and to prevent recurrence of the thickening. The part may be kept soft, either by water dressing or by frequent soaking in hot water. The thick skin may then be pared off with the knife. The application of liniment of iodine will help to remove the excess of cuticle.

URTICARIA, otherwise known as nettle-rash. The disease is characterised by burning and itching, and by the presence of nodules due to spasm of the muscular structure of the derma and serous infiltration of the papillæ. It is a form of erythema of the skin. In some persons the nervous susceptibility of the skin is so great that the least touch gives rise to the development of wheals. These, although well marked, leave no trace behind when they disappear. Urticaria may be acute or chronic, and is apt to recur.

Causes.—These are external or local and internal. In the first category may be placed scratching or other mechanical irritation, as due to bites or stings of insects, and stinging hairs of plants, as nettles. Among internal causes may be mentioned certain articles of diet, especially fish and certain fruits; the use of particular drugs, as copaiba, turpentine, cubebs, &c. Other causes of urticaria are dyspepsia, an excitable state of the nervous system, fevers, worms, and menstrual disturbances. It is often classed as a neurotic disorder, being symptomatic of nervous derangements, and associated with cough and asthma. It sometimes occurs during pregnancy. It may exist as a temporary condition, and accompany pruritic affections, as scabies, eczema, and the presence of pediculi.

Symptoms.—These are constitutional and local. The constitutional symptoms which are associated with this affection are derangement of the system, as indicated by slight febrile phenomena, vomiting, and prostration. Locally there is excessive hyperæmia of the skin, itching, and prominence of the nodulated protuberances. The disease appears and disappears suddenly ; often it disappears in one part and shows itself in another, and thus lasts for some time. It frequently returns at night, preventing sleep. The eruptions or the tubercles are pale or white, and appear on a bright red ground; they may be discrete or coalesced, and either superficial or deep-seated. In some cases the white prominences take the form of round tubercles, at other times they occur in stripes or wheals. They are accompanied by a sense of burning or prickling. In some cases the face swells enormously. Urticaria is not followed by desquamation.

Treatment.—The cause must be removed, and disorders of digestion remedied by sulphate of magnesia, with bitter infusions or quinine. To improve the condition of the liver and give tone to the stomach and bowels nitro-muriatic acid or alkalies with bitters are useful, according to circumstances. Where the disease is purely neurotic large doses of quinine and bromide of potassium are indicated. Locally, soda-bicarbonate is useful as a wash. Some use lime-water with oxide of zinc. Heat locally applied or a hot bath is sometimes serviceable. In children the wheals are not so distinct, and are followed by development of fleshy papules. Chronic urticaria is unattended with any fever, and in these cases arsenic is very beneficial. To relieve itching some recommend a lotion of benzoic acid and water. It is often necessary to give sedatives in order that sleep may be restored.

VERRUCA.—Warts. They are small hypertrophied papillary growths from the skin due to excessive production of cuticle, and forming hard prominences of the integument. Warts are most often found in weak children and in elderly persons, and are due to want of healthy condition or of normal power. The affection is sometimes of a neurotic origin. It may attack any part of the body, but in adults its chief seat is the face. Warts may appear as tubercles scattered here and there, or as clusters, or as patches covering extensive surfaces. Those appearing on the scalp and hands are generally prominent and fully developed, these peculiarities being due to increased nutritive activity of the skin and to abundance of the epidermis in these situations. When fresh they are conical and smooth on the surface; after a time they became flat. Old warts are generally found to be made up of several segments. On examination a wart is found to consist of vascular papillæ of the skin enclosed in a sheath of cuticle. Warts are generally sessile, but those on the scalp are often pedunculated. Warts on the penis when venereal are generally cauliflower-like. In colour, warts are normally grey, but on account of their retaining dirt they often appear dark brown. The venereal warts are bright red and each papilla is pointed. Warts are sometimes mistaken for lepra, ichthyosis, epithelioma, and syphilitic growths. In lepra, the hypertrophied papillæ and cuticle present layers of scales. In ichthyosis the hypertrophied cuticle and papillæ are associated with filiform and branched processes. Epithelioma of the skin has adherent scabs covering superficial ulceration; there is also infiltration of adjacent tissues, enlargement of the neighbouring glands, and pain. The growth is also rapid. Syphilis often gives rise to chronic papillary inflammation of the skin. There is the history of syphilis, and the presence of papillary growths known as condylomata which are generally moist, and are found around the genital organs.

Treatment.—Attempts must be directed toward their removal. This is best effected by agents which dissolve the epidermis, the principal of which is acetic acid. It acts by destroying the whole structure of the wart; one operation may suffice, but sometimes the application must be repeated. The wart thus removed seldom returns. When the warts are numerous and where acetic acid does not act successfully, a concentrated solution of potassa fusa is the best application. Where the warts are numerous and spread over a large part of the body, the application of sulphur or tar-ointment will suffice and may be aided by liquor arsenicalis given internally. Calomel and oxide of zinc form the best application for condylomata.

Vitiligo.—Leucoderma. These are different from the white patches of true leprosy. Leucoderma occurs first in minute spots which are free from pigment. They are circular in form and vary in number and extent. The skin is otherwise healthy but the integument is deeper in colour near the margin of the patch than on the rest of the surface. In long-standing cases, these spots become enlarged either by increase of their circumference, or by coalescence of several of them by continuous growth. The affection might be mistaken for morphœa and scleroma, but in these the affected skin is not in a healthy condition. It is distinguished from leprous patches by the latter being anæsthetic and associated with constitutional symptoms.

Treatment.—There is want of pigment-function of the skin due to feebleness of tissues, and therefore the strengthening of the individual by healthy exercise and by tonics, as arsenic, is likely to be of benefit. Locally, the skin should be stimulated by friction or applications of sulphur or tar-ointment.

XANTHELASMA.—It occurs as flat, laminated, or plate-like yellow patches in the superficial layers of the skin, or as small raised tubercles, or isolated nodules. The chief characters are its colour, situation, form, and anatomical structure. The colour is yellow, the spots are slightly elevated, generally solitary, and may be surrounded by papules of a yellow colour. They are most commonly seated near the inner angle of the upper eyelids, and are usually symmetrical on both eyes. The disease is also met with on the palms and soles, and flexures of joints. It is always circumscribed, and either smooth on the surface or granulated or nodulated. The tubercular variety is attended with tenderness and itching. The disease sometimes affects the mucous membrane of the nose, palate, trachea, gums, and tongue. It is often associated with some functional disorder of the liver as jaundice, and it has been supposed to be due to defective nutrition and growth of certain tissues of the body. As a result there is an increased deposit of pigment in certain parts. The disease has been found to be hereditary. Cases have been seen in children from birth or early infancy. It affects the healthy as well as the sick. Xanthelasma generally takes a chronic course. The nodules when limited in extent can be removed by surgical aid.

Treatment.—As the disease is due to defective nutrition and to some derangements of the liver, those remedies which would improve digestion and promote healthy function of the liver are useful. Nitro-muriatic acid, blue pill, and vegetable bitters are indicated, and arsenic is a very useful nutritive tonic for this disease. Potassa fusa is the best caustic for use in limited xanthelasma.

XERODERMA.—The term means dry skin, and is applied to an affection in which there is defective nutrition or atrophy of the skin. The disease is characterised by discolouration, dryness, and roughness of the skin. The integument is hard and wrinkled, and the epidermis is thickened and often forms crusts on the surface.

The disease is congenital and often hereditary and resembles ichthyosis. The perspiratory functions are impaired, but there is no pain or other subjective sensation.

The *treatment* is that of the constitutional condition; arsenic would probably be serviceable, and warm baths and friction would improve the condition of the skin.

DISEASES OF THE KIDNEYS.

HYPERÆMIA OR CONGESTION OF THE KIDNEYS.

The branches of that part of the renal artery which belongs to the middle and outer part of the cortical substance, go exclusively to form the afferent vessels. As such they enter the Malpighian capsules, and divide to form the vessels of the glomeruli. They leave the Malpighian capsules as efferent vessels, and break up into branches which reunite as renal veins. On the boundary between the cortical and medullary substances there is a tract in which there are arteries from which branches arise, and form *afferent* vessels of the glomeruli, and *efferent* vessels with long offshoots running into the cortical and medullary substance, and others on which there are no glomeruli, but which act as *nutrient* vessels for the medullary substance. The resistance of blood is greatest in the glomeruli, and is normally considerable; therefore, when pressure increases in the renal arteries, hyperæmia is first manifested in the cortical substance, and next in the glomeruli; and there is little hyperæmia in other parts. When the renal veins are obstructed the result is different. The narrowness of the efferent glomeruloid vessels prevents the glomeruli from becoming engorged with blood. The contents of the arteries are in such cases usually reduced, therefore the glomeruli are scantily supplied with blood, and the quantity of urine is diminished.

Hyperæmia of the kidney may be either acute or chronic, fluxional and active, or obstructive and passive in character. As a rule it gives rise to various pathological changes and clinical phenomena. The urine is albuminous; it may even contain blood and hyaline casts of the tubules. It is scanty in amount, but the specific gravity is normal. If the cause can be removed the condition generally ends in recovery. In the passive form, the congestion is apt to recur, and often ends in death owing to complications.

Causes.—Active congestion is due to increased influx of arterial blood, which may be brought about in a variety of ways: 1. By those agencies which increase the blood pressure in the renal arteries. An example of this is the transient plethora of the vessels caused by copious draughts of liquid; in each case the glomeruli are overloaded. 2. As a consequence of the action of certain irritants, as cantharides, copaiba, turpentine, and cubebs; also of various blood-poisons, as in scarlatina, typhus fever, and measles. 3. It may be due to agencies which cause dilatation of the afferent vessels by paralysing the muscular fibres of the small arteries, as occurs in exophthalmic goitre. Passive congestion occurs in the course of obstructive cardiac and pulmonary diseases. Thus it is common in (*a*) dilatation of the right heart; (*b*) in emphysema of the lung leading to dilated heart; (*c*) where there is impediment to the blood in the course of the inferior vena cava or in the renal veins, as by pressure of a tumour or aneurysm, or by a thrombus. In cases where the congestion is due to any persistent cause, it may, sooner or later, give rise to Bright's disease.

Pathological changes.—These are probably less marked after death than during life, as the congestion passes on to other changes or disappears. The kidneys are generally of normal size or somewhat enlarged. The capsule is easily detached, and the surface smooth. On section, the vessels are dilated; the Malpighian bodies are highly vascular and stand out as red points. The stellate veins on the outer surface and those of the medulla are overloaded. There are evidences of inflammatory changes. In the tubules the epithelium is granular and opaque, the lumen being filled with coagulated fibrin. Sometimes there is an extravasation of blood in the tubules. The stroma is unaltered. Occasionally there is catarrh of the canals of the pyramids, and the straight tubules of the medullary substance often yield a yellowish creamy fluid on pressure. In cases of passive congestion the pathological changes vary; they are more marked in severe cases and in those where congestion has been long-continued. In mild cases the kidneys are of normal size and shape, the capsule is easily separable, and the surface smooth. On section the veins and Malpighian bodies are highly engorged, and sometimes there are extravasations of blood and fibrinous coagula in the tubules. In more chronic cases the changes more nearly resemble those found in Bright's disease. The organs are somewhat indurated, the capsule is easily separable, the surface is somewhat uneven. The induration is owing to a slow increase of interstitial fibrous tissue. On section the organ is firmer than natural, the small veins and the Malpighian bodies are full of blood, the fibrous stroma is increased, some of the tubules are wasted, some are blocked up with exudation products, and some present evidences of disintegration and fatty changes of the epithelium. In severe cases we find the condition of the stroma as one of cirrhosis, while the tubules are in a state of inflammation. Under the microscope the epithelium is seen to be destroyed, the walls of the tubes thickened; there is increase of the intertubular connective tissue, and distension of the capillary vessels. In some cases emboli are observed in the cortical portion, and also infarctions similar in form to those found in congestion of the spleen. Where the infarctions are absorbed we find depressed cicatrices, but where infarctions have softened down abscesses are found.

Symptoms.—In fluxional hyperæmia the urine is of normal specific gravity, high coloured, and albuminous. Occasionally it contains hyaline casts, epithelial cells, and more or less blood. The course is generally transient and harmless, unless it runs on to inflammation or recurs from time to time. Other symptoms are nausea and sickness, feverishness, and great thirst. There may be slight pain and tenderness in the loins, increased by pressure or movement, and there is irritability of the bladder. In passive congestion albuminuria is the chief symptom. The urine is somewhat lessened, but of normal specific gravity. It has an acid reaction and deposits urates on standing, and contains albumen, a little blood, and a few fibrinous casts. The tube-casts are often wanting; they are generally hyaline or bloody, and occasionally contain altered epithelium. When the disease subsides the urine increases in quantity and improves in quality. In many cases inflammation supervenes, and leads to organic changes in the kidneys. In such cases the urine contains various forms of casts, as the hyaline and blood casts, and also epithelial casts and a diminished amount of urea. In some cases suppuration occurs, occasionally uræmic poisoning, and other results of Bright's disease supervene.

Diagnosis.—In congestion the points to be considered are the cause, the presence of lung or heart disease, or venous obstruction; the symptoms, as the urine scanty, of a high colour, of normal specific gravity, and rarely depositing blood. Under the microscope renal epithelium and tube-casts are sometimes found. In nephritis or inflammation the points are the condition of the patient, the history, and the condition of the urine, which is scanty, high coloured, of high specific gravity, containing blood, renal epithelium, and tube-casts.

Treatment.—When congestion is secondary its intensity is lessened with diminution of the primary disorder, towards which the treatment must be directed. Where the congestion has an independent origin, and the symptoms are threatening and dangerous, energetic treatment is necessary. Perfect rest, cupping over the loins, warm baths, and active purgatives are useful remedies. Unirritating diuretics and plenty of acidulated drinks are recommended. In the case of cardiac disease digitalis with iron, and of lung disease digitalis with squills, are usually indicated. Sometimes carbonate of ammonia with cinchona is useful. A little blue pill may be given to act upon the liver. In persons liable to congestion of the kidney the greatest care should be taken to prevent relapses Exposure to chills should be scrupulously avoided, and flannel should always be worn next the skin.

Bright's Disease—Acute and Chronic Nephritis.

The kidney is enclosed in a tough, thin, lightly-adherent, translucent capsule. It is composed of a complicated and convoluted series of tubes lined with epithelium. Lying between the tubes and supporting and binding them together is a thin, delicate network of fibrous tissue and numerous blood-vessels. The straight tubes constitute the medullary substance, while the convoluted tubes and the Malpighian bodies form the cortical substance. Each and all of these parts are in a greater or less degree subject to disease, and, as a rule, when one part becomes affected the others sympathise with it. Thus diseases of the tubules, or of the fibrous tissue, or of the blood-vessels, all merge into one another, and are found in varying degrees as Bright's disease.

Inflammation of the kidneys presents three varieties: 1. Tubular inflammation, which may be acute or chronic. 2. Inflammation of the stroma, which may be acute or chronic. 3. Suppurative inflammation, which will be separately treated of. In Bright's disease we include three distinct affections of the kidney, each involving chiefly one of the individual structural elements of the organ, the other structures being secondarily affected. Thus, the inflammation may begin in (1) the uriniferous tubules; (2) the blood-vessels and the Malpighian tufts; and (3) the fibrous stroma. The morbid condition affecting the tubules is known as *tubular nephritis,* and may be acute or chronic; that which commences in the vessels generally leads to degenerative changes, and is known as *waxy, lardaceous, albuminoid,* or *amyloid* degeneration; that affecting the fibrous stroma is extremely chronic, and resembles in its pathological changes *cirrhosis* of the liver.

1. **Tubular Nephritis.**—This may be acute or chronic. The acute form is otherwise known as acute Bright's disease, acute albuminuria, acute inflammatory dropsy, or acute desquamative nephritis. It is an inflammatory affection of the tubules. When the acute inflammation affects the fibrous stroma and also the tubules the disease is known as acute parenchymatous nephritis. The inflammation when prolonged becomes generalised, and the affected organ passes through various stages of enlargement, fatty degeneration, and atrophy.

In the early stage the tubular inflammation is characterised by (1) scanty urine, containing albumen, blood, and tube-casts; (2) dropsy. These cases generally end in recovery. In advanced cases, besides albuminuria and dropsy, other secondary changes are found. These affect the heart, blood-vessels, and other organs, and end in death by dropsy, uræmia, or complications.

Causes.—These are predisposing and exciting. The predisposition is common in children. The commonest exciting cause is the poison of scarlatina; nephritis is nearly as common in confluent smallpox, but rarely occurs in connection with measles and other exanthemata. All causes which induce albuminuria temporarily will, if neglected, give rise to inflammatory Bright's disease. Other blood poisons which similarly predispose to tubular nephritis are diphtheria, erysipelas, pyæmia, typhus fever, acute rheumatism, and pneumonia. Cold is the commonest cause in the adult. It acts with a special force on those exposed to draughts of cold air while perspiring. Heart disease, pregnancy, gout, and malaria are also causes of Bright's disease. Intemperance and large doses of cantharides or turpentine have been known to bring on this disease.

Pathological changes.—Acute Bright's disease is a catarrhal inflammation of the uriniferous tubules, and has a tendency to pass through various stages. In the first stage, or that of active inflammation, the kidneys become enlarged, softened, and mottled. The capsule is thin, opaque, and easily separable. The surface is smooth, the cortex dark red and swollen. On section a large quantity of blood oozes out; the cortical substance is increased in bulk, and is dotted with dark red points of extravasation throughout its substance. These dark points are the engorged Malpighian corpuscles. The vessels of the cortex, as well as those of the cones, are congested. The pyramids are hyperæmic and marked with red streaks. Opaque and bloody liquid is found in the calyces and pelvis. The whole structure appears somewhat coarser than natural. The convoluted tubes are swollen and opaque, and sometimes contain blood. The microscope reveals distension of the capillaries; the tubules are found to be dilated, dark, opaque, and often occluded and compressing the capillaries. The tubes contain many detached epithelial cells, which are granular, opaque, and in a state of disintegration. In some cases all the tubes are affected, in others comparatively few. The intertubular stroma is unaffected. The enlargement of the organ is due to distension of the capillaries, to exudation of fibrin, to increase of red corpuscles, and to increase of detached epithelial cells. In advanced cases the exudation increases, and the kidney becomes pale and more opaque. In this stage, unless death or recovery take place, the disease passes on to the second stage, known as *fatty transformation.* The kidney remains enlarged, the capsule is easily separable, the surface is mottled, and presents stellate veins. There is no extravasation of blood, but patches of fatty material alternating with natural structure. The inflammation does not involve the whole structure of the kidney, but only the epithelium lining the uriniferous tubes, and hence the disease is known as *tubal or desquamative nephritis.* The tubules are cloudy and swollen; the nuclei are multiplied, so that the tubules become distended, their channels narrowed, and even obliterated. The epithelial cells become fatty and detached in great abundance, and the tubes contain new cells, which are granular, opaque, and disintegrated. The tubules at a later period also become occupied by casts, which are hyaline or granular, or consist of blood in an altered condition. The morbid process may extend and implicate the renal vessels of the medulla and the Malpighian tufts. The stellate veins on the surface become congested and appear distended. The engorged Malpighian tufts occasionally give way, and blood is extravasated into the interstitial tissue, or into the tubules, or into the Malpighian capsules. In some cases the interstitial tissue is from the first the seat of disease. Besides the affection involving the epithelium lining the tubules and vessels, we also find proliferation of the nuclei in the membrane lining the Malpighian vessels and the muscular walls of the arterioles. The lymphoid cells collect in the intertubular connective tissue, and surround them. These cells accumulate about the bases of the pyramids, then they spread into the medulla, and lastly into the cortex along the vessels. These often reach the surface of the kidney, and also implicate the connective tissue between the Malpighian bodies and the tubules. On section the cortical substance is increased in size. The convoluted and also the straight tubules are occupied by sebaceous material. The microscope reveals the black appearance of the tubules owing to fatty degeneration of their contents. Many of the tubules are occluded by this oily matter. This degeneration generally sets in within a week or two of the commencement of the inflammation, and may last for years. Recovery from this stage is the exception, and death often takes place. Sometimes patients survive to pass into the third stage, that of atrophy. The kidney is now diminished in size and weight; its surface is puckered and presents depressions and elevations which look like sago granulations. The capsule is opaque, thick, and slightly adherent to the subjacent surface. The colour of the kidney is pale on section, the cortex is atrophied, and the Malpighian bodies are not prominent. The tissue is more dense, with here and there patches of fat in the tubules. The fibrous stroma is increased, especially towards the surface of the kidney. The small renal arteries are sclerosed, the middle coat being chiefly thickened. The atrophy is not the result of pressure of the fibrous stroma, but of the molecular absorption of the contents of the tubules. Other morbid appearances are also found, due to complications, as hypertrophy, valvular disease of the heart, and diseases of the lungs.

Pathology.—The disease originates in the blood, and not in the kidneys. The blood-poison at first produces certain changes in the vascular system, at first functional, but afterwards organic in character. It induces high arterial tension and subsequent hypertrophy of the heart and atheroma of the vessels; at the same time it affects the kidneys, as well as other excretory organs. The former, in order to remove the poison, become congested, and as a result epithelial and other changes occur. Acute nephritis is a catarrhal inflammation of the uriniferous tubes. The exudation takes place into the Malpighian bodies, tubules, and into the connective tissue. At first there is congestion of the organ and rupture of the capillaries of the Malpighian bodies; this is soon followed by proliferation of the epithelial elements, and their rapid desquamation takes place. These desquamated cells further block up the tubes. The blood now becomes more deteriorated, and is poisoned with excrementitious matters. These effete matters mix with the urine, which is also scantily secreted, and contains fibrinous coagula, desquamated epithelial cells shaped in the form of uriniferous tubes, and known as tube-casts. It also contains blood, owing to the rupture of blood-vessels from over-distension or to paralysis of the vessels, due to the presence of effused products. The blood in the urine gives the latter a smoky or dark appearance. In this catarrh the increased secretion of mucus or of the epithelial cells is not freely discharged, as is the case in inflammation of any other mucous surfaces, but owing to the complex structure of the uriniferous tubes the morbid products are to a great extent retained, and more or less close up the tubes and further interfere with the functions of the kidneys. In some cases, owing to defective action of the skin and other excretory organs, their excreta become accumulated in the blood, and more work is thrown upon the already overburdened kidneys.

Symptoms.—The leading clinical features in the inflammatory form are: (1) albuminuria, a symptom common to every form of Bright's disease; (2) scanty urine; and (3) dropsy. The disease begins generally with a rigor, but in some cases uræmic symptoms or dropsy may be the first indication. The symptoms refer to (*a*) the inflammatory fever; to (*b*) changes in the quantity and quality of urine; (*c*) to the poisoned state of the blood; (*d*) to dropsy; and (*e*) to complications. Sometimes there is diminution of urine at the commencement of the disorder; in other cases dropsy or gastric disturbances. Generally there is inflammatory fever with heat and dryness of the skin and elevation of temperature. The pulse is hard and cord-like; the tongue is coated; there is headache, great thirst, loss of appetite; scanty, somewhat opaque, smoky, or even bloody urine. There may be nausea and sympathetic vomiting; there is dull aching pain, with tenderness in the loins and derangements of the stomach and bowels. Dropsy may be present, and is generally most distinct on the face, which soon becomes puffy; there is swelling of the connective tissue throughout the body, and particularly of the eyelids, in which it is well marked in the morning; the hands, legs, and scrotum also swell, and there is effusion of fluid into the serous cavities. The swelling of the feet and legs is most noticeable in the evening and after exercise. If only one kidney be diseased there may be no dropsy. Micturition is frequent, especially at night, but the patient notices that his urine is scanty, of a dark, smoky colour, often turbid or dark brown from admixture of blood. On examination it is found to contain much albumen, derived either from rupture of the renal capillaries or from exudation of serum into the tubules of the kidney. When allowed to stand for a time it deposits abundant amorphous urates, and often blood. The quantity of urea and inorganic salts is less than normal, and may reach only one-half or one-fourth of the natural amount. The specific gravity is also low owing to the diminished quantity of urea, unless there is compensatory diminution of water and an increase of albumen. The reaction is acid. Under the microscope the urine is found to contain numerous tube-casts, which are granular, and consist of coagulated fibrin, of epithelial cells, and blood- or exudation-corpuscles, and occasionally contain crystals of uric acid. Hyaline casts are also found. Blood-corpuscles are abundant in the early stage. Sometimes there are amorphous urates and uric acid crystals, and also fatty matter; the tube-casts are of various sizes. There is slight quickening of the pulse and elevation of temperature. The hardness and tension of the pulse is indicative of the high arterial tension which accompanies the cardiovascular changes. There is a good deal of general restlessness, uneasiness, and pain in the loins.

Terminations. — In some cases under appropriate treatment recovery takes place within a week or two, or at a still later period. In favorable cases the coagula are washed away, the urine improves in quantity and quality, albumen is diminished, dropsy becomes less, the skin also becomes moist and the health improves. Very often the recovery is incomplete and acute cases merge into the second stage of fatty degeneration or chronic albuminuria, and such cases are for the most part incurable. Occasionally acute

Bright's disease ends in death. Dropsy appears in the serous cavities and causes difficulty of breathing; or other serious conditions are developed such as suppression of urine followed by coma or convulsions.

The chronic inflammatory form.—This form is characterised by the same symptoms as the acute form, but in a less marked degree. They are associated with secondary changes in the heart, blood-vessels, and other organs. In this stage the urine is not bloody; its quantity is increased, but is less than during health. Its specific gravity is also low, it contains albumen, and the urea is diminished. Under the microscope it is found to contain tube-casts, fatty, and hyaline. The dropsy comes and goes, often appearing when the patient is fatigued or when he has caught cold. In advanced cases, growing anæmia and weakness are common symptoms. In this state the disease may go on for many months, when death may occur from the formation of a thrombus in the pulmonary artery, or from intercurrent pneumonia or œdema of the larynx. In rare cases there may be a partial recovery from this stage of fatty degeneration, and the patient passes into a third stage, that of atrophy. When this stage occurs the urine improves in quantity, but the specific gravity is low, and it contains albumen. Under the microscope we find a few hyaline casts with a few fatty cells within them. The urea is still less abundant. There is dropsy of the feet and ankles, chiefly noticed at night. The face is pale and pasty and the eyelids are generally œdematous. The attacks of dropsy recur after exposure to cold. In advanced cases the pulse becomes hard and tense, the arteries appear tortuous and feel thick from sclerosis, and are also atheromatous. The heart, especially the left ventricle, is hypertrophied, and the apex beat is felt downwards and to the left side. Such cases generally end in death by acute uræmia, or by complications, or by acute exacerbations of symptoms with general dropsy.

Chronic Bright's disease, otherwise known as chronic albuminuria, presents three varieties which may be distinguished anatomically and sometimes clinically. The anatomical appearances in the chronic stage are three. These are (1) a waxy or amyloid condition, an affection originating in the vessels; (2) small, red, cirrhotic or gouty kidney, originating in the fibrous stroma; (3) large, pale or fatty kidney.

Chronic Bright's disease may be an independent affection or a termination of an acute attack. As a termination of the acute form a detailed account has already been given while treating of acute Bright's disease. It now remains to describe the chronic forms occurring as independent affections.

Waxy or amyloid degeneration.—It is a chronic affection of the kidney, supposed to be connected with certain constitutional disorders, as gout, syphilis, phthisis, scrofula, malarious and other dyscrasiæ. It is often associated with tedious suppuration as in caries and necrosis of bones, or other exhausting diseases as cancer. The affection of the kidney is often associated with amyloid disease of other organs as the liver or spleen, or the intestinal canal, but it may occur independently. During health a small quantity of fat is found in the epithelial cells of the kidney, but in this disease the fat is abnormally increased. The degeneration commences in the Malpighian bodies, small arteries, and sometimes in the basement membrane. It leads to destruction of the secreting cells, and is often followed by transudation of fibrin into the tubules. This degeneration passes through various stages of transformation: (*a*) simple degeneration, (*b*) enlargement from transudation, and (*c*) atrophy.

Pathological changes (simple degeneration).—This is the earliest stage of degeneration. In this stage the kidney is of a natural size and shape, the colour is not altered, and the capsule is easily separable. On section the Malpighian tufts are prominent but not congested, and by transmitted light appear translucent. The small arteries are also affected. Application of the iodine solution test yields a characteristic mahogany colour, peculiar to waxy degeneration. Under the microscope the stroma and the tubules are healthy, but the vessels, and chiefly the transverse fibres of the middle coat of the arteries, have a swollen or ipecacuanha-root appearance, and respond to the test of iodine. After a time other changes are observed; there is enlargement of the kidney from transudation, with secondary changes in the tubules. The kidney is firm, pale, and increased in weight, the surface smooth, the capsule peels off readily, and there is no mottling. On section the cortical portion is increased, looks pale, or white or yellowish in colour, and has a waxy appearance. It is paler than the pyramids, and in structure it is tougher than natural. The vessels are prominent, and the Malpighian tufts resemble minute grains of boiled sago. The iodine solution test gives the degenerated parts a characteristic mahogany colour. Under the microscope the vessels are more altered than in the previous stage. The stroma is normal; the tubules appear altered, being blocked up by wax-like material. Within the tubules the epithelium is granular and occasionally fatty; but the epithelium and basement membrane do not yield the characteristic reaction. The degeneration is primarily confined to the blood-vessels, the tubules becoming secondarily affected. Where the tubules are degenerated the nutrition of the epithelium is destroyed, and the tubules contain only the coagulable material or the exudation products. This stage may last for years. When the disease extends the degeneration merges into the third stage—that of atrophy. In this stage the kidney is diminished in size and weight, the capsule strips off readily, the organ is pale, the surface uneven and granular. On section the cortical portion is relatively lessened, the small arteries are thickened and tortuous, the Malpighian bodies are prominent and crowded together, the stroma is increased, and many of the tubules are destroyed. Some are merely thread-like and denuded of epithelium; some contain only a few fibrous cylinders, others only scattered disintegrated epithelium.

Symptoms of the waxy disease.—The disease is insidious in its onset. There may be a history of phthisis or of syphilis, or of other chronic wasting disease. For some years there is gradually increasing debility; feeble, frequent, and easily compressible pulse; pallor and puffiness of the face. The patient complains of frequent micturition, especially at night. The urine is increased in quantity; from the first it is of low specific gravity, and is very pale; the urea is somewhat less than normal. The urine contains a few tube-casts, mostly of the hyaline kind; the albumen is slight or absent at first; ultimately it is considerable in amount. The odour of the urine in these cases often resembles that of the secretion passed after a dose of cubebs. There are dyspeptic derangements, a tendency to inflammation of the serous membranes, and occasionally to amaurosis. There is little tendency to uræmia and convulsions. Anasarca of the limbs and dropsy of different cavities are seldom found. As the disease advances the urine becomes less in quantity, its specific gravity becomes high, and the albumen abundant. In these respects the symptoms are like those of granular kidney, but in this affection evidence of degeneration of other organs is often found. The liver and spleen are enlarged; the blood is poor, the white corpuscles being increased, the red being rather ill-defined. In the granular kidney the heart is hypertrophied and the pulse is heaving. All the symptoms gradually become more marked, the patient loses strength, and becomes depressed. Death may be due to exhaustion, or to intercurrent diseases, or to coexisting affections of the kidneys or other organs.

Cirrhotic Bright's disease.—This is a chronic affection, and more tedious than waxy degeneration. It is supposed to be due to abuse of alcohol; the poisons of gout, rheumatism, and lead also predispose to it.

Pathological changes.—The disease consists at first in the increase of the fibrous stroma and thickening of the capsule, ultimately ending in atrophy. The changes in the tubules and vessels are always secondary. The kidney is at first of a natural size and the capsule is separable, but with some difficulty. The surface is uneven, and may present cysts. On section the cortex is enlarged, the change being due to an increase of the stroma, and not to any alteration in the vessels or in the tubules. The disease is, however, mostly seen in advanced stages. The kidney is then diminished in size and weight; its surface is puckered and presents depressions and elevations; the capsule is opaque, thick, and firmly adherent to the subjacent surface. On section the cortex is atrophied, with here and there patches of fat, and forms a thin rim around the bases of the pyramids. It is of a brownish colour and granular in texture, the whole being tough and firm. This toughness is due to increased proliferation of the intertubular connective tissue which, pressing on the uriniferous tubules, narrows their calibre and destroys them. Hence the kidney is large at first, and subsequently small and contracted, just as occurs in cirrhosis of the liver. Cysts are sometimes found in connection with the tubules and Malpighian bodies. Under the microscope the secreting structures are found to be extensively destroyed, the Malpighian bodies reduced in size and crowded together; the uriniferous tubes are atrophied; some are merely thread-like and denuded of epithelium; some contain only a few fibrous cylinders; others, only scattered, disintegrated epithelium. The whole organ is disorganised, but in a few cases some portions remain healthy. The bladder is greatly contracted.

Pathology.—The mischief begins in the intertubular substance and the tubes are entirely unaffected. In every case there is hypertrophy of the fibrous stroma, and owing to the pressure and contraction of this fibrous material the uriniferous tubes and Malpighian bodies are compressed and destroyed and the kidney is reduced in size. Where the fibrous material extends to the surface it causes depressions and superficial granulations. The development of cysts is common in this form of Bright's disease. These are of varying sizes, and are due to obstruction of the tubes by exudation, or to the pressure of the fibrous material, the spaces left between the tubes thus becoming dilated.

Symptoms of the cirrhotic form.—These cases are extremely chronic. The onset is insidious, and the disease may exist for years, without being diagnosed or presenting marked symptoms. In many cases the patient becomes thin and emaciated without any obvious cause. He complains of dyspeptic symptoms, of loss of appetite, occasional nausea, and vomiting. Very often its existence is first suspected owing to impairment of sight. Under the ophthalmoscope there is greyish effusion of serum into the retina and in the neighbourhood of the disc; also emptiness and degeneration of the retinal vessels, causing numerous spots or white lines along the margins or round the optic discs. It often happens that the earliest symptom is frequent micturition at night. The urine, if examined, is moderate in quantity and slightly albuminous. It is of light colour and low specific gravity—1005 to 1010. The urea is somewhat less than normal and the chlorides are deficient. In advanced cases, or where the disease may have lasted for years, the health and strength suffer, the complexion is pale and anæmic, and the eyes appear somewhat puffy from œdema of the conjunctivæ. Dyspeptic symptoms are more marked, but dropsy is generally absent, or only observed at intervals, and then begins as anasarca. The heart becomes hypertrophied, and there is atheroma of arteries. In still more advanced cases there is marked constitutional cachexia, with dyspepsia, severe gastric catarrh, and diarrhœa; very often dyspnœa, palpitation of the heart, bronchitis, or œdema of the lungs supervene. In many cases uræmic symptoms are noticed. The hypertrophy of the left ventricle often leads to tumultuous action of the heart; the heart-sounds are muffled, and there may be an aortic murmur. Towards the close there is an increase in the quantity of urine, which is of a low specific gravity. Death may be due to uræmia, heart- or lung-complications, or may be the result of some degenerative changes leading to gastric or cerebral hæmorrhages. With regard to the condition of the blood, in the inflammatory form the water is increased, while the corpuscles and albumen are diminished. The urea is somewhat increased. In advanced cases of waxy kidney and in long-standing cirrhosis the white corpuscles are increased; the red corpuscles are flabby. Bleeding from the mucous surfaces, and chiefly from the nose, commonly occurs in the advanced stage of cirrhosis. Hæmaturia is common in the early stage of inflammatory Bright's disease. In the waxy degeneration hæmorrhage is rare. The respiratory system often suffers. Bronchitis, acute or chronic, and œdema of the lungs are common in advanced cases. Œdema of the lung also occurs in the early stage as a manifestation of general dropsy. It may be suddenly developed in cirrhosis of the kidney, and is often fatal. Pneumonia may occur in any stage, and in advanced cases it is often due to exposure to cold. Phthisis is a common accompaniment of waxy degenerative kidney. Hydrothorax is a manifestation of general dropsy. Dyspnœa often occurs, and is due to uræmic poisoning. It is frequent in the inflammatory and the cirrhotic forms. Other symptoms are connected with the nervous system. Headache is a common complaint in Bright's disease; cerebral apoplexy is also common in advanced stages of the inflammatory and cirrhotic forms. It is due to the degenerated state of the vessels, or to increased pressure resulting from cardiac hypertrophy.

With regard to uræmic blindness the symptom is generally sudden, and occurs as a passing condition in advanced stages of the inflamatory and cirrhotic forms. Retinitis, almost amounting to complete blindness, is common in cirrhosis and in advanced inflammatory kidney. Uræmia occurs at all stages, but in the uncomplicated waxy form it is rare, while in the cirrhotic kidney it is most common. There may be sudden convulsions, followed by coma and death, or gradual torpor followed by coma. The digestive system is often affected. Nausea, vomiting, and catarrh of the stomach are common in all forms of Bright's disease. They are more marked in the inflammatory form, both at the commencement and in advanced stages. The cause of this derangement is supposed to be the effort of nature to eliminate those materials which are retained in the blood and cannot be removed by the kidneys. In the waxy form the gastric catarrh is due to the degenerated state of the vessels of the gastric mucous membrane. Hæmatemesis in the waxy form is also due to the degeneration. Diarrhœa is common and exhausting in the advanced stage of the inflammatory and cirrhotic forms. In waxy kidney the intestines are often ulcerated and contain tuberculous matter, and there is diarrhœa and often blood in the stools. The derangements of the liver in connection with Bright's disease are numerous, and are both functional and organic. Waxy liver is a constant accompaniment of waxy kidney. In cirrhotic renal disease cirrhosis of the liver is nearly always present. Ascites, as a part of general dropsy, is found in connection with the inflammatory and waxy forms.

With regard to affections of the skin dropsy is constant, and generally exists as anasarca in the inflammatory form. Eczema is troublesome, and often attacks the legs in chronic cases.

Diagnosis.—In acute Bright's disease the characteristic symptoms are marked dropsy, diminution of urine, the presence of abundant albumen and epithelial casts, with diminution of urea. The urine also contains blood. There is absence of any degeneration and complications. There is previous history of undue exposure, or of scarlet or other exanthematous fever.

Bright's disease may be mistaken for passive hyperæmia of the kidneys; for paroxysmal hæmatinuria; for temporary albuminuria; and for hæmaturia. In passive renal congestion, there is history of chronic lung- or heart-disease, presence of congestion in other organs, while the urine is generally scanty, high coloured, and the specific gravity is not low. There may be albumen and urates in excess, but under the microscope there is rarely any blood, renal epithelium, or tube-casts. Hyaline casts may be found, but are extremely few. If actual disease of the kidney be present, casts will be more or less abundant, and the urea will be diminished. In paroxysmal hæmatinuria the onset is sudden, the progress rapid, and the duration short. There are marked nervous symptoms, gastric disorder, slight jaundice, but no dropsy. The urine is dark-red in colour, due to granular pigment. The microscope reveals the presence of this pigment and hyaline casts. In paroxysmal albuminuria the amount of albumen and the number of tube-casts are very large. Blood in the urine may be mistaken for acute or chronic Bright's disease. Where hæmaturia occurs without Bright's disease the microscope reveals scarcely any casts, or only a few epithelial tube-casts. In acute Bright's disease there may be history of scarlatina or diphtheria, or the presence of paralysis. In the bloody urine there is a peculiar reddish-brown deposit, and the microscope reveals blood-corpuscles and epithelial tube-casts, and dropsy is generally present. In the chronic form (cirrhotic or cystic) there are the complications connected with the heart or blood-vessels, and the character of the pulse, the retinitis, the small quantity of urine of low specific gravity, the small amount of urea and the tendency to hæmorrhage in other parts are confirmatory of chronic Bright's disease.

In chronic Bright's disease the difficulty as regards the diagnosis lies in distinguishing acute and curable cases from those of chronic disease. If with an acute attack albumen continues even though other symptoms have subsided, the chronic disease is probably present. If with albumen, blood-corpuscles and epithelial elements are also found in the urine, the condition indicates the declining stage of the acute form ; but if there be no blood and no epithelial casts, the case is certainly one of chronic Bright's disease. In the waxy form of the disease the commencement is insidious, and there is often a history of chronic phthisis, chronic suppurating diseases, constitutional syphilis, enlarged liver or spleen, intemperance, gout, or lead-poisoning. The cirrhotic form commences with polyuria and the heart and vessels are gradually affected.

Prognosis.—In Bright's disease the prognosis, on the whole, is unfavorable. In acute cases, due to exanthemata, recovery is the rule. In inflammatory cases recovery may take place in the first stage. In the second stage the prognosis is more serious; death often takes place from the exacerbation of the symptoms. Many cases continue in this stage for a long period. In the third stage death is almost certain, the system being extremely deteriorated, and the condition of the kidney going from bad to worse. Increased discharge of urine, diminution of blood and albumen, abatement of fever and swelling of the body, and a more healthy appearance of the face are favorable signs. If the urine steadily decreases in quantity and contains abundant albumen, epithelium, and tube-casts, the prognosis is serious; and if with these œdema of the lungs or glottis, or signs of uræmia set in, death is certain to follow. The prognosis as regards duration of life is somewhat more favorable in the aged than in the young. In chronic cases the structural changes are such as cannot be repaired. As the disease progresses these changes increase more and more, and involve other portions of the kidney; the blood becomes contaminated with excrementitious matters, and at last a limit is reached when life cannot be sustained. The course of the disease is often very tedious. Life may be prolonged for years under care and proper attention. Unfavorable cases are those where the disease is of long duration, the skin is dry, the urine much altered in quantity and quality, and complications exist. In such cases the urine, which has previously been abundant, steadily diminishes in quantity, although the specific gravity may continue the same, and there is persistent fever. Fatal cases are those where pneumonia or pericarditis, or suppression of urine, or obstinate vomiting, or diarrhœa supervenes upon the previously existing unfavorable signs. Recovery takes place where the cause of degeneration can be removed. In cirrhosis of the kidney the prognosis is very unfavorable, but the disease may last for years, and it may be far advanced before its existence is noticed. In the waxy form the prognosis is bad, though the fatal issue may be delayed for some time. In all cases of chronic Bright's disease the prognosis greatly depends upon the circumstances and general condition of the patient. If he can be surrounded with all possible care and comforts the prospect, as a general rule, is very different from what it would be under opposite circumstances.

Complications.—These are met with in all forms of Bright's disease, but some of them are peculiar to the inflammatory forms, others to the waxy, and others to the cirrhotic forms. The complications, which are numerous, affect (1) the circulatory system; (2) the respiratory system; (3) the nervous system; (4) the digestive system; (5) the urinary organs; and (6) the skin.

1. The circulatory system.—Hypertrophy of the heart is met with in advanced cases of the inflammatory form (acute Bright's disease), and in all stages of the chronic form (cirrhotic kidney). In the waxy degeneration it is somewhat rare. Endocarditis often occurs in the various forms of Bright's disease. Pericarditis is

mostly associated with the inflammatory and cirrhotic forms, but it may be present in the others as well. Fluid in the pericardium is an occasional complication in cases where the general dropsy is a marked symptom. The arteries are sclerosed and atheromatous. This complication is a constant accompaniment of cardiac hypertrophy, and, like it, is met with in the advanced inflammatory and in the chronic cirrhotic forms. In the waxy degeneration this change is rare and less marked, but the small renal vessels are peculiarly affected. With regard to the minute pathological, vascular, and cardiac changes in chronic Bright's disease, in the early stage the tunica adventitia is normal, the middle coat is hypertrophied, while the tunica intima is thicker than normal, and has a tendency to become fibrous. There is an increase of the connective tissue round the small arteries. In advanced cases the adventitia is normal, but an increase of the fibrous tissue connects this coat with the perivascular tissue; there is also marked hypertrophy of the middle coat. The internal tunic is considerably thickened, and contains round cells and spindle-shaped fibres. The channel or the lumen is very much reduced or entirely obliterated, owing to the proliferation and subsequent fibrous transformation of the connective tissue of the internal tunic. The increased growth is due to irritation caused by the circulation of a blood-poison, similar to that generated by gout, syphilis, rheumatism, chronic alcoholism, and lead. Similar changes take place in the arterial system in general. The vessels of the pia mater, spleen, liver, &c., are found to have suffered, though in a less degree than those of the kidneys.

Hypertrophy of the heart is often connected with chronic Bright's disease. As a rule, where the obliteration of the channels of the arterioles is most marked the hypertrophy is found in a greater degree. It is secondary, and due to obstruction of circulation of blood in the kidneys and in the systemic vessels.

Various other vascular changes are also noticed, especially in connection with the Malpighian bodies. These changes are the result of compression or contraction, caused by infiltration of the cells of the intertubular stroma, and also to their fibroid changes. The capillaries round the glomeruli are thus compressed, and contain less blood. The loops become impervious, and are rendered useless, or they undergo colloid degeneration and form a homogeneous mass. The capillary loops of the glomeruli being obliterated, the blood from the afferent vessels is prevented from entering the efferent vessels. As a consequence there will be a certain rise in the blood-pressure, leading directly to the presence of albumen in the urine, and also to cardiac hypertrophy. In the cirrhotic form there is a stage of cell-transformation and shrinking of the kidney, and the rise of blood-pressure is due to destruction of the capillaries in the intertubular stroma; to changes in the renal vessels and in the systemic vessels, leading to thickening of the walls and narrowing of their calibre; to destruction of the glomeruli by simple atrophy or colloid degeneration, or by cystic dilatation. Nature endeavours to counterbalance the rise of blood-pressure by a compensatory effort. Those renal vessels which are not much altered now become abnormally permeable, and thus permit the transudation of albuminous substances. The glomeruli being destroyed, direct communication becomes established between the afferent arterioles and the efferent vessels. Anastomoses also take place between the phrenic, suprarenal and lumbar vessels and the vessels of the capsule of the kidney, and as a consequence a portion of the blood-supply to the kidney is cut off. The compensatory efforts being insufficient, the blood-pressure becomes more heightened, and thus obstructs the circulation. The heart thereupon begins to hypertrophy, and in a great measure overcomes the obstacles, provided that the general nutrition of the system is good.

Treatment.—In acute Bright's disease, the main indications of treatment are: 1. To subdue the inflammation. 2. To remove the inflammatory products from the kidneys. 3. To remove the deleterious or effete products which accumulate and poison the system. 4. To attend to the urgent symptoms.

1. To subdue inflammation.—To effect this result or to lessen the hyperæmia of the kidney, the patient should be confined to bed and covered with flannel. Local blood-letting by means of leeches or cupping in the loins, followed by poultices and hot fomentations are useful. Leeches are very serviceable in the early stage, especially when there are threatening symptoms of suppression of urine. Counter-irritation is more useful in advanced cases, and may be applied by means of iodine paint or croton-oil liniment.

2. To remove the inflammatory products.—This is best effected by diuretics. The more powerful remedies of this class are generally irritating to the kidneys, and are therefore likely to be mischievous. Those should be used which without irritating promote the secretion of urine and thereby remove the products which block up the uriniferous tubes. Water, and diluent drinks are sometimes sufficient. Digitalis is good for this purpose and can be safely given even if the urine is bloody. It may be combined with acetate of potash, sweet spirits of nitre, and dialysed iron. This last is often a good diuretic and tonic. In many cases squills and even carbonate of ammonia will assist the action of digitalis.

3. If notwithstanding these measures the urine diminishes in quantity and becomes more bloody, and other serious symptoms set in before the diuretics begin to act, it is best to endeavour to induce perspiration and to relieve the overloaded tubes by diaphoretics and warm baths. The secretions from the liver and bowels should also be promoted. Saline purgatives, compound jalap powder or even elaterium may be given. Constipation should always be prevented. The best diaphoretics are liquor ammoniæ acetatis and antimonial wine. Resorcin and even pilocarpin and wet sheet-packing assist considerably in promoting perspiration. After the acute symptoms have subsided, the dropsy which continues may be combated by bitartrate of potash and spirit of juniper. The albumen, which is persistent and due to the chronic inflammatory condition of the tubules, may be diminished by gallic acid, ergot, and belladonna. Attention to diet is all-important. It should be nutritious and easily digestible, but not too rich in nitrogenous constituents. Milk may be given freely if it agrees with the stomach. In advanced cases a small quantity of stimulant may be allowed.

4. Urgent symptoms.—Nausea and vomiting may be best relieved by hydrocyanic acid or creasote, or by iced milk and soda water. Counter-irritation to the pit of the stomach or chloroform liniment will sometimes suffice. Diarrhœa unless very urgent should not be checked. In severe cases astringents must be given. Observations have been made by eminent physicians on the effect of diet in chronic cases. In patients kept on an absolute milk diet the amount of albumen was found to be considerably reduced. Eggs when taken in excess did not appreciably reduce the amount of albumen but absolute rest had a marked effect in this direction.

In the chronic form the indications of treatment are three. 1. To prevent, if possible, further extension of mischief. 2. To prevent complications. 3. To treat urgent symptoms, as progressive anæmia, diarrhœa, and dyspeptic derangements.

In the waxy form the cause of degeneration should be ascertained, and, if still existing, removed as far as possible. When due to syphilis or to chronic suppuration it must be combated by suitable treatment. Various tonics as quinine, nux vomica, iron, and phosphorus may be given from time to time. The functions of the skin should be promoted by warm baths. In the cirrhotic form, temperance should be strictly enjoined. Any symptoms of gout should be treated, and lead-poisoning dealt with as promptly as possible. Iodide of potassium and arsenic have some repute in this form. Throughout the disease in all its forms iron is highly useful. With regard to complications, hæmorrhage may be subdued by iron, gallic acid, or ergot; or ergotine may be subcutaneously injected. The bronchial catarrh will need counter-irritation to the chest, as by liniment of ammonia or camphor, and expectorants. Exposure to cold must be scrupulously avoided. General dropsy needs diuretics, diaphoretics, and purgatives; punctures in the integument of the œdematous legs and hands and over the tense scrotum will often give relief. Headache, which is sometimes most annoying, may be relieved by ice to the head, by quinine internally, or by inhalation of nitrite of amyl. The treatment of uræmia will be given in the chapter on that subject. Opium and its preparations are to be avoided in all forms of Bright's disease.

Suppurative Nephritis—Renal Abscess.

Suppuration in the kidney may be either acute or subacute. It is often associated with diseases of the bladder, and with decomposition of the urine in the pelvis of the kidney and pyelitis, but it is sometimes found in the absence of these latter symptoms. It is characterized by local pain and tenderness, scanty and albuminous urine, and constitutional symptoms, which rapidly assume a typhoid character, ending in death.

Causes.—The condition may be due to (1) injury, wounds, or contusions; it sometimes follows operations on the bladder or urethra; (2) exposure to cold; (3) propagation of inflammation from the urinary passages to the kidney; (4) renal calculi, which produce irritation leading to pyelitis; (5) next in frequency comes pyæmia, or the presence of septic materials in the blood, leading to metastatic abscesses in the kidney; (6) it is rarely the result of embolism of small arteries of the kidney.

Symptoms.—They are those of acute nephritis passing into suppuration, which is indicated by the setting in of rigors during the course of the disease, and sometimes by the formation of a fluctuating tumour in the lumbar region. The disease is generally confined to one kidney. The abscess may open into the pelvis of the organ, and its contents may be discharged by the ureter or into the loins. It rarely opens into the colon or the duodenum.

Pathological characters.—The affected kidney is larger than its fellow. The capsule may be readily separable, but it is sometimes firmly adherent, and on being removed it tears the surface and pus escapes. The surface of the organ is mottled or discoloured in patches. The tissue presents various stages from mere congestion with exudation to consolidation and suppuration, occasionally associated with perinephritic abscess. Under the microscope bacteria are often found within the tubules, setting up irritation and thus inducing suppuration. The abscesses are often scattered throughout the substance of the kidney.

Diagnosis.—From pyelitis: In suppurative nephritis there are tube-casts, but no characteristic angular cells of the calyces of the pelvis. From perinephritis: In suppurative inflammation there is, as a rule, absence of a distinct tumour and of history of perinephritis.

Prognosis.—The disease is always fatal.

Treatment. — The patient's strength must be supported by nourishing diet, tonics, and stimulants. Leeches oftentimes relieve the distress and pain. Locally, poultices and fomentations may be prescribed. When suppuration has set in, ammonia, bark, and stimulants are indicated. When there is clear indication of an abscess having formed in or around the kidney, a careful opening may be made in the lumbar region. If life is prolonged, pain may be relieved by hyoscyamus, belladonna, or hydrate of chloral. If the urine be alkaline, nitro-muriatic acid may be given. Sandalwood in capsules may be given in order to diminish the quantity of pus. Opium in any form must be avoided.

Fatty Disease of the Kidney.

This is a chronic affection, characterised by fatty changes, viz. degeneration of, or infiltration into, the renal epithelium, with absence of inflammation.

Causes.—This condition sometimes arises in cases of long-continued exhausting disorders. It may be caused by phosphorus-poisoning and by excess of fatty food. It has also been noticed in cases of starvation and of marasmus in old age.

Pathological changes.—The kidneys are natural in size, their consistence is diminished, and they are soft and flexible. Congestion is absent and the stellate veins are not seen. The surface is smooth and white or mottled, with fatty-looking deposits. The capsule is easily separable, and is somewhat thin and opaque. On section, the cortical portion and the cones appear considerably thickened, the general colour is white or yellowish, and there are numerous yellow streaks due to fatty degeneration or infiltration in the tubules. The normal striated appearance being altogether absent, the pyramids are pink and present a marked contrast to the pale colour of the cortex. The uriniferous tubes contain cylinders of fat, which is found in the epithelial cells. The Malpighian bodies, the stroma and vessels are of natural appearance, but the epithelium of the cortex is swollen and granular. Under the microscope the uriniferous tubes are seen to be enlarged and to contain epithelial particles and cells more or less opaque and granular, with oil-globules and fat. There are no exudation corpuscles nor hyaline fibrinous casts showing absence of inflammation and of desquamation of the cells. The intertubular substance is unaltered. As the disease progresses the distended tubes and their contents are broken up into granular *débris*, and afterwards absorbed. The Malpighian corpuscles are slightly enlarged, and their capsules are thin. The kidneys remain large and smooth to the last. These changes are brought about by the destruction and gradual absorption of the distended tubules and their epithelial contents. In advanced cases the cortical substance is destroyed, and the whole organ undergoes amyloid changes.

Symptoms.—The disease generally succeeds an acute disorder; the invasion is sudden, and may follow repeated pregnancies, or exposure to cold. The disease occurs in persons under thirty years of age. Dropsy or serous effusion is a common symptom ; the face is pale, puffy, and pasty and the skin smooth, white, and glossy. There is a tendency to secondary complications, as pneumonia, peritonitis, uræmic poisoning and convulsions, but not to valvular disease or hypertrophy of the left ventricle. The urine is generally scanty, its specific gravity either normal or somewhat raised ; it is pale, cloudy, or somewhat smoky, and may contain a little free oil. On standing it deposits amorphous renal *débris* and epithelial, granular, fatty, or hyaline casts. There is no albumen.

Prognosis and Treatment.—There is little to be said under these heads. The prognosis will depend upon the condition of the patient and the existence of other disorders, and the treatment will be influenced by similar considerations. The measures suitable for chronic Bright's disease will be generally advisable.

Tuberculosis of the Kidney.

This disease affects the kidneys and ureters. It is generally chronic and lasts for years, and is associated with tubercular pyelitis. The disease is often secondary to tubercles in the testes. It is generally caused by tubercular infection, or by strumous inflammation of the kidneys. As a tubercular infection it forms part of general tuberculosis when it runs a very rapid course and ends in death.

Causes.—There is a history of tuberculosis, and males are more often affected than females. The disease may occur at any age, but is more common in children and young persons. Both kidneys are rarely diseased. The right is generally worse than the left, but one kidney may be quite free and healthy.

Pathological changes.—When due to tubercular infection we find minute miliary nodules scattered throughout the structure of the kidney. As a consequence of strumous inflammation there is a formation of large masses affecting the mucous membrane of the pelvis of the kidney or the cortical substance. The deposit often begins in the cortex and extends to the urinary passages, or it may begin in the pelvis and then extend upwards and downwards. The deposit beginning in the cortex consists of grey miliary tubercles, which soon coalesce and form masses of crude tubercles, and then extend to the pyramids. In such cases the kidney is enlarged and presents a lobulated surface. The masses ultimately soften down and form abscesses, which burst and are discharged with the urine as pus and tuberculous *débris.* On section, conical masses of altered tissue corresponding to the prominences of the lobules are found. Some of them are solid and cheesy, others soft in the centre, and others present a cavity with white walls containing pus and *débris.* The lining of the walls consists of ragged shreds of fibrous tissue. The renal structure is generally destroyed, and the remaining portions may have the appearance of waxy, degenerated masses. The deposit of tubercles in the mucous membrane of the pelvis and ureters at first invades the submucous tissue and forms either a granular, rough, thick, opaque layer or small patches. This layer soon disintegrates, the surrounding mucous membrane is destroyed and forms a slough which is discharged with the urine mixed with pus and blood. The canal is narrowed or completely obstructed by granular *débris.* Where the ureters are completely blocked up by tubercles, pyonephritis with dilatation of the kidney and extensive destruction of the renal tissue results, sometimes to such an extent that a mere sac of the kidney remains. Where the ureter is partially open the kidney retains its size, or may become somewhat contracted. Tubercles often invade both kidneys; when one kidney only is affected the organ shrivels up and contains putty-like *débris,* rich in cholesterine or calcareous nodules. The disease rarely runs an independent course, as the prostate, bladder, and testes are similarly affected.

Symptoms.—When the deposit occurs in small nodules there are no marked symptoms, but in advanced cases they are often those of chronic pyelitis and of chronic inflammation of the bladder. There is at first a dull pain in the lumbar region with frequent micturition. This latter symptom may be so marked as to give rise to the suspicion that the bladder is the seat of disease. There are also some constitutional symptoms. The urine is natural but sometimes excessive in quantity; it may be acid or alkaline. It may contain albumen, and sometimes when passed it is smoky. As the disease becomes established the urine contains pus and caseous *débris*, or characteristic cheesy material and sometimes blood. Under the microscope there are blood-corpuscles, pus-corpuscles, a number of pyriform cells from the bladder, granular *débris*, masses of softened cheesy material and shreds of elastic tissue. The urine if tested is feebly acid and more or less albuminous owing to the presence of pus and blood. As the case progresses emaciation follows ; there is hectic fever with chills and pains in the loins and tenderness on pressure. The kidney in some cases becomes sacculated and is very painful. Where the ureter is blocked up with tubercles the pus in the urine becomes less, the kidney is increased in size, and the pain is aggravated. In some cases a tumour is felt in the lumbar region, and percussion reveals increased area of renal dulness. If the obstruction in the ureter be less complete, the pus reappears in large quantity, the tumour becomes diminished, and the pain is lessened. In advanced cases the lungs and intestines also become implicated and tubercles are deposited in them. There is cough, dyspnœa, and also diarrhœa. Where both kidneys are affected, the urine is suppressed and symptoms of uræmia set in. Usually death occurs from exhaustion, from profuse suppuration, or from complications, as phthisis or diarrhœa.

Duration.—The duration varies from two or three months to as many years.

Diagnosis.—The existence of signs of chronic pyelitis without obvious cause but with evidences of tubercles in other parts, is suggestive of tubercles in the kidneys. If the urine contains pus, granular matter, and the characteristic cheesy tuberculous matter (insoluble in acetic acid), and shreds of connective tissue and cast-off disintegrated mucous membrane, and if there is also rapid emaciation, the diagnosis in favour of tubercles is confirmed. If phthisis or ulceration of the bowels coexist, the probability is still greater. From cancerous pyelitis it is known by the characters of the urine, which is bloody rather than purulent. In tubercles, on the other hand, it is wholly purulent, or only slightly bloody.

Prognosis.—Where tubercles are confined to one kidney the prospect is less serious than when both organs are involved. In the latter case it is unfavorable owing to local and constitutional conditions.

Treatment.—This is the same as that of tuberculosis generally. The strength should be supported by cod-liver oil, tonics, good diet, and stimulants. Pain may be relieved by sedatives. Profuse secretion of pus may be checked by tincture of iron or copaiba, or sandal-wood oil.

DROPSY OF THE KIDNEY—HYDRONEPHROSIS.

In this affection, owing to some obstruction in the ureter, the urine remains in the pelvis of the kidney and causes its dilatation. It is a chronic disease of the kidney and the dilatation of the pelvis and of the ureter is attended with atrophy of the renal substance. The disease usually affects one kidney, but sometimes both. There is a soft fluctuating tumour in the loin, which collapses after the sudden passage of a large quantity of urine.

Pyonephrosis.—This condition is similar to hydronephrosis, but in the former affection there is distension of the pelvis of the kidney with pus. This is owing to obstruction in its passage through the ureter into the bladder.

Causes.—The condition may be congenital, being due to malformations. The most common causes are: Closure of the ureter at its lowest part by impaction of a stone or by some growth or tumour, as carcinoma of the uterus, tumour of the ovary, or new formations in the bladder. Stricture of the urethra, cicatrisation of an ulcer, pressure of a pregnant or prolapsed uterus, are less common causes. The condition is also sometimes found associated with moveable kidney.

Pathological changes.—In milder degrees of hydronephrosis the papillæ of the pelvis are shrunken, hard, and leathery. In advanced cases the ureter may be equal to the inferior vena cava in calibre. At first the cones are flattened and wasted gradually, the renal substance is tough, much diminished in bulk, and may be reduced to a membranous sac, containing altered urine and pus. In advanced cases the dilatation of the pelvis is great.

Symptoms.—If the sac be small and the other kidney sound there will be no symptoms during life as only one ureter is involved. In some cases there are no constitutional symptoms, but the local changes are prominent. If, however, the sac be inflamed there will be rigors. If the distension be very great there will be a large palpable tumour in the loins. The renal tumour is known by being painless, and seated in the lumbar region close to the spine. It may extend upwards to the hypochondrium, and downwards to the ilium, and in front to the anterior abdominal walls. The colon is usually in front of it, and is displaced and compressed, and hence constipation is common. The small intestines are pushed aside. In hydronephrosis the tumour has a soft undulating feel, and is distinctly lobulated and fluctuating. It does not change its position with respiration. The urine from time to time is passed in large quantity; is less rich in solid constituents; is pale, watery, of a low specific gravity, and often contains mucus without albumen. In advanced cases it is charged with decomposing pus and blood. The tumour often disappears with the sudden discharge of a large quantity of urine. Where hydronephrosis is due to impaction of a stone there is in addition nephritic colic from time to time. As the case goes on, the obstacle may be dislodged completely and recovery follows. If the tumour be of long standing it may shrink up into an empty sac. Hydronephrosis when double is generally fatal from suppression of urine and uræmia. When only on one side death may occur from pressure of the sac on important organs or from impaction of a stone in the kidney of the opposite side.

Diagnosis.—The disease may be mistaken for ovarian cyst, ascites, hydatids, and perinephritic abscess. *Ovarian cyst:* In hydronephrosis the colon is in front of the swelling; the history of the case, the position of the tumour, and vaginal and rectal examination will serve to distinguish the two affections. *Ascites:* In ascites there is dulness in both flanks. In hydronephrosis, the dulness is fixed, limited, and unaffected by change of posture. *Hydatids:* The history of the case, the presence of parasites in the urine, will establish the diagnosis, and it must be remembered that hydatids seldom attack both kidneys. In *perinephritic abscess* the tumour is hard, and there is fever, rigors, and severe pain.

Prognosis.—This is always grave, but when the hydronephrosis is unilateral it may last for years. If both organs are involved the case is very serious.

Treatment.—The patient should take plenty of liquid to keep the urine well diluted. As the swelling is painless it may be manipulated with oil or lubricating ointment with a view to force the contents into the ureter. Tapping with an aspirator may also be tried.

Embolism of the Kidney.

In renal emboli the most important lesion is the hæmorrhagic infarction. Next in severity is inflammation of the kidney and its results in secondary abscesses. A still more rare ending is gangrenous inflammation.

Pathological changes.—The emboli may be composed of fibrinous coagula or of fragments of the tissue of the valve, which have been separated by ulceration. The coagula may also be derived from fragments of fibrin entangled within the meshes of the fleshy columns of the heart, or from the roughened inner coat of arteries.

In endocarditis and in endarteritis this condition of renal embolism sometimes occurs. In *hæmorrhagic infarction* the morbid material undergoes various changes; it first appears as red consolidation, which afterwards assumes a fawn colour, and may undergo absorption and atrophy. In form the infarctions are conical or wedge-shaped, with the base towards the surface. In this stage the vessels are congested, and many are ruptured, giving rise to extravasation of blood into the tubules. In the second stage the redness is replaced by fawn-coloured masses; the cells of the tubules are destroyed, and within the tubules, as well as in the stroma, blood-pigment may be found. In the third stage a fibrous cicatrix is all that remains.

Inflammation and secondary abscess.—As a result of emboli occurring in the course of pyæmia abscesses form. Gangrene very rarely occurs.

Symptoms.—There may be a previous history of valvular heart disease or of calcareous degeneration of the arteries. If under such circumstances blood or albumen suddenly appears in the urine the probability is that the case is one of embolism. In addition there is often some febrile disturbance and pain in the region of the kidney. In pyæmic cases albuminuria or hæmaturia is added to the other symptoms. Renal embolism may be mistaken for Bright's disease. In the former the onset is sudden and the duration short; there is history of cardiac disease or calcareous degeneration of the vessels, and absence of dropsy.

Prognosis.—It is generally favorable if the infarction is confined to the kidneys. The emboli may, however, involve more remote parts, particularly the brain.

Treatment.—Very little can be done by way of treatment. Attention must be directed towards the relief of the primary lesion.

Morbid Growths of the Kidney.

Enlargements connected with the kidney are known as renal tumours. The kidney may be hypertrophied or may have a cystic growth within it, and there may be accumulation of some fluid in the pelvis of the kidney, or in the kidney itself. Calculi sometimes form in the kidney, and cause enlargement. The most important of these growths are carcinoma and tubercles. Hydatids are also met with in connection with the kidney. Syphilitic formations are rare.

Malignant growths.—Cancer of the kidney may be either primary or secondary to cancer of some other organ. In either case the disease is chronic, and always ends in death. It presents itself either as nodular formations or as an infiltration.

Causes.—As a primary disorder it occurs most frequently in children under five years of age; it is also met with in advanced life. The male sex is more liable to it than the female, and the right kidney is more often affected than the left. As a secondary formation cancer of the kidney is associated with cancer in other parts, as the liver, the stomach, the mammæ, the testicles, or the uterus. Occasionally the mesenteric glands are the primary seat of the disease.

Post-mortem appearances.—On opening the abdomen the colon is generally found in front of the growth, other organs being also displaced. Thus, in cases of affection of the right kidney, the liver, and of the left, the spleen, are pushed out of their positions. In some cases the growth extends into the pelvis, and also blocks up the ureter. Of all the varieties of cancer the medullary is by far the most common. When primary it seldom affects both sides. On post-mortem examination of such cases a large quantity of clot with cancerous matter is often found within the tumour. The growth occurs in two forms, nodular and infiltrated. It always begins in the cortex and ultimately extends to the pyramids. In the cortex it first invades the connective tissue. In its further course it spreads to the ureters and renal vessels. The infiltrated variety is smooth on the surface; the nodular form is irregular. A cancerous kidney often attains a very large size, and may weigh several pounds. The surface is smooth, or here and there lobulated, and in certain places it has a soft feel. The cancer is subject to degenerations, softening, suppuration, and hæmorrhage. Very often the tumour forms extensive adhesions with the surrounding parts. In the scattered form the intervening portions of the kidney are healthy. The disease is often associated with a similar affection of the lymphatic vessels and glands. It may involve the colon, peritoneum, and even the skin. When the cancer is secondary the growth always affects both organs. There is seldom so great an enlargement of the kidney as in the primary disease. The growth is generally nodular; it begins in the stroma, or along the vessels, and the remaining renal substance is healthy or only inflamed.

Symptoms.—There are two marked symptoms of renal cancer, viz., a tumour in the abdomen and hæmaturia. The tumour appears in front between the margins of the ribs and the ilium. There is dulness which extends quite back into the lumbar region. The surface of the tumour is indurated; in some cases the growth fills nearly the whole of the abdomen. There is no resonance between that area and the spine, as occurs in enlargement of the liver. The colon generally lies in front of it, and over that portion the percussion is resonant, but in all other parts it is dull. On palpation the growth is smooth or lobulated, with irregular margins. Sometimes the tumour feels soft and sacculated. It is always fixed in its position. Owing to the communication between the tumour and the ureter the urine becomes altered, and the cancerous contents are sometimes voided with the urine. For some time the urine may be of a normal colour, of a natural specific gravity, of healthy quantity, and acid reaction. In the course of the complaint there is always hæmaturia, which is often irregularly intermittent. It is generally moderate, but sometimes profuse. The urine often contains epithelium from the pelvis and ureter, mixed with blood. The presence of cancer-cells, if detected, is quite diagnostic, but it is extremely difficult to find them for three reasons: (1) the cancer-cells very much resemble the epithelial-cells of the pelvis or ureter, which are always found in such urine; (2) the cancer-cells on their way to the urine are apt to become broken down and degenerated, and hence cannot be detected; (3) the urine itself has a further degenerative action on the cancer-cells. In cancer the other symptoms are constipation and pain in the loins, which is generally paroxysmal and shooting in different directions. Where these symptoms are absent the tumour only causes inconvenience by its weight and size. Derangements of the stomach and loss of appetite are often noticed from the first. The patient becomes emaciated, and there is a faint yellowish discolouration of the surface. In far advanced cases pressure on the inferior vena cava causes œdema of the lower limbs. Ultimately exhaustion sets in, and the patient dies. The disease is generally fatal within a year.

Diagnosis.—There is a tumour in the flank, but it may be due to enlarged liver, spleen, ovary, or uterus; or it may be mistaken for ascites or aneurysm of the aorta; or for perinephritic abscess, for diseases of the mesenteric glands, for obstruction of the colon, or for retained fæces. In enlarged spleen the tumour is situated higher up, and on palpation a notch can be felt. The blood is poor in its constituents, but is not present in the urine. A renal cancer is often nodulated, and the colon is in front of the tumour. In perinephritic abscess there is fever and a feeling of fluctuation, and the disease is generally longer in its duration. In enlarged mesenteric glands the mass is very nodular, and situated more in the middle of the abdomen. Enlarged liver is sometimes mistaken for cancer of the right kidney, and chiefly in children. In the former there is no space of clear percussion between the liver and the tumour, as is always found in the diseased kidney.

Treatment.—This is, of course, merely palliative. All that can be done is to relieve the urgent symptoms. Thus pain may be relieved by opium, either by the mouth or rectum, or hypodermically injected, or by hyoscyamus, cannabis, or belladonna. The hæmorrhage may be checked by ergotine, acetate of lead, and tannic or gallic acid. Iron may be given as a blood tonic and astringent. Constipation should be prevented. If there is great distress from ascites the fluid should be removed by tapping.

ENTOZOA, OR PARASITES IN THE KIDNEY.

These are (1) hydatids or echinococcus; (2) bilharzia or Distoma hæmatobia; (3) Strongylus gigas; (4) Pentastoma denticulatum.

Hydatid disease of the kidney is a chronic affection, due to the presence of parasites in the organ. It is caused by the introduction of the ova of Tænia echinococcus, which exists in the intestines of dogs. The disease is common in persons subject to attacks of tapeworms, and in places where dogs and wolves abound, such as Egypt and South Australia. The affection is common in Europe, but rare in India. Iceland is said to be the most infected locality. The ova of this worm lead to the development of the hydatid cysts known as Echinococcus hominis in the substance of the kidney, but hydatids are less frequent in this organ than in the liver.

Pathological appearances.—One kidney is generally affected, the left being the more prone to suffer. In structure the growths resemble hydatids of the liver. The affected organ is more or less enlarged, and often contracts adhesions with neighbouring parts. The cysts are generally found between the capsule and the gland; they encroach upon the renal tissue, and may ultimately lead to its destruction or atrophy. They appear as rounded tumours on the surface of the organ. The outer covering of the cysts is made up of the renal substance; the inner coat contains numerous smaller cysts and processes growing from the walls, and also scolices which give origin to tapeworms. In some cases the cyst-wall is simply extended into a large cavity containing saltish fluid. The cysts may open into the pelvis of the kidney, and be discharged by the ureter, but when they exist in the cortical portion they may remain latent for years before they burst into the infundibula, or open externally. The cysts very often suppurate, or contract adhesions with the surrounding parts and perish, and the entozoa may thus become destroyed. In such cases the liquid portion becomes absorbed, and the whole dries up, forming a pultaceous mass. The kidney then contains the remains of shrivelled cysts with hooklets from the scolices.

Symptoms.—The disease is generally chronic, and may last for years. The onset is very insidious. In advanced cases a renal tumour, irregularly rounded and globular, and of an elastic feel, is felt in the loins. The parasites by their presence set up inflammation and ulceration, and when they escape through the ureters they give rise to symptoms of renal colic, such as severe pain, often of an intermittent character, followed by pain at the end of the penis, and frequent micturition. The urine, if examined, is found to contain pus, blood, and vesicles, and remains of parasites. The parasites resemble Tænia echinococcus, as seen in the liver. When suppuration takes place in the cyst the case resembles one of an abscess of the kidney. Recurrences of the symptoms are common. The cyst may discharge into the lung, and there is then cough, irritation of the pleura, and purulent expectoration.

The diagnosis depends upon the presence of a tumour and the discovery of cysts or hooklets ; the prognosis is favorable, as the hydatids are generally discharged by the ureters.

Treatment.—There are no special remedies. Anodynes may be required to relieve the pain, and warm baths and diluents to promote the flow of urine. The removal of the contents of the cyst by means of an aspirator has been followed by a cure.

2. *Bilharzia.*—It is a trematode worm found in the branches of the portal system, the small veins of the pelvis of the kidney, ureter, and bladder. The presence of these worms gives rise to inflammation, discharge of mucus, blood, shreds of tissue, and ova. The characters of this worm will be described in a subsequent chapter. It is the cause of the endemic form of hæmaturia so common in Egypt and South Africa.

Symptoms.—Severe and intermittent hæmaturia without any apparent cause is the first symptom. The worm sets up irritation and inflammation of the urinary tract, which may end in suppuration. In some cases it forms a nucleus for the development of a calculus in the kidney, and it often causes great debility and anæmia. When it obstructs the ureter or the pelvis it may lead to hydronephrosis or pyelitis.

Treatment.—Turpentine, male fern, and salines are recommended as useful remedies for the destruction of the parasite. When the bladder is affected injections of iodide of potassium, in twenty-grain doses every second day are found serviceable.

3. *Strongylus gigas.*—This parasite is rare in man, but is said to resemble Acaris lumbricoides in the intestines. It is a large nema-

tode worm, and has six nodular papillæ about the head. It is found in North America in dogs, oxen, and horses.

4. *Pentastoma denticulatum* is also rare in man, and is described as devoid of sexual organs. It is only one-sixth to one-eighth of an inch in length, and has a double pair of hooks. It is common in the liver of the ox and goat.

Renal Calculus—Nephrolithiasis.

This disease is characterised by the formation of concretions as a result of abnormal deposit of one or more of the solid constituents of the urine upon a nucleus. Where the concretion consists of mere gritty particles it is known as gravel. The calculus may be single or many; may be found in one kidney or in both at the same time. Renal concretions occur at all periods; they are even common in newborn children.

Pathology.—Renal calculi are often primary and formed in the infundibula or uriniferous tubes. They are due to some deposit from the urine, which may be composed of some normal ingredients as uric acid and oxalate of lime. Any abnormal condition of the urine such as marked acidity from excess of uric acid, or an alkaline reaction or deficiency of water tends to cause a deposit of some of its ingredients. A calculus if examined is found to consist of a central nucleus surrounded by one or more layers or crusts. The primary nucleus may be uric acid or oxalate of lime; but it is often some other matter as cystine, carbonate of lime, phosphate of lime, or mixed urates. The precipitation is often due to the presence of a colloid matrix, composed of mucus or blood-globules. The deposit increases slowly until the concretion causes the duct to become obliterated. The concretions may either remain lodged in the kidney or be washed by the urinary stream into the pelvis and onwards into the ureter. Very often they become impacted in some part of the urinary tract and are developed into a fully-formed renal stone which may attain an enormous size. The uric acid calculus is by far the most common. Even in children in whom oxalate of lime is common such calculi are very frequent. Other varieties are known as mixed or alternating calculi. These are composed of alternate layers of uric acid, oxalate of lime, and phosphates, which last form the outer crust. Uric acid calculus is very common in persons of gouty diathesis, in whom the urine is scanty, acid, and of a high colour. This form of calculus is hard, tubercular, heavy, oval, of moderate size, and contains much urinary pigment. Calculi containing urates and oxalate of lime are always formed in the kidneys, and are primary in their origin. Phosphatic calculi, on the other hand, are secondary formations.

Pathological results of a calculus on the kidney.—The results depend on the size of the stone. At first there is irritation leading to local congestion and inflammation. In a few cases it leads to the formation of an abscess within or external to the capsule. When the stone remains in the pelvis of the kidney chronic pyelitis ensues and is often accompanied by atrophic changes. There is dilatation of the pelvis with wasting of the renal structure. A calculus remaining in the pelvis more or less rapidly increases, and becomes branched in form.

Symptoms.—Sometimes the presence of renal calculi gives rise to no symptoms. They may be even developed to a large size and still be unsuspected. Sometimes a great number quite fill the pelvis, and are found on post-mortem examination without their presence having been suspected during life. In a few cases they even escape through the passages without causing any pain. Usually there is a dull, aching, colicky pain in the lumbar region on one side and shooting in various directions, especially forwards and downwards to the groin and bladder. The pain is increased by jolting or by any exercise, and also when from some cause the stone shifts its place, or when it enters the ureter. Under the last-named circumstances the pain is known as renal colic, and is of an acute character; the patient is restless and bathed in perspiration, and there is cutting pain at the end of the penis and during micturition. The condition becomes one of great agony, and there is often nausea and vomiting. The patient sometimes becomes faint and collapsed; the bladder is irritable and there is constant desire to pass water. The urine is scanty and discharged in drops or suppressed. There may be hæmorrhage, and the urine is smoky from its containing blood or clots. In advanced cases the urine contains blood, albumen, mucus, pus, and epithelium cells due to the existence of pyelitis. It also contains uric acid or oxalates. All the above-mentioned symptoms come on suddenly, and may last for a few hours or days. In favorable cases they end suddenly, the calculus reaches the bladder, when the patient feels intense relief and recovery follows. The calculus is either discharged with the urine, or retained in the bladder to become the source of further mischief.

In advanced cases and where the calculus has remained lodged in the kidney, a tumour may sometimes be felt in the lumbar region, and may be best detected by putting the patient on his back with the knees drawn up; on pressing the kidney with one hand in front and the other behind, the tumour, at least in thin persons, can be made out.

Diagnosis.—Renal colic may be mistaken for intestinal colic, perityphlitis, bilious attacks, and cancer. In all these affections there is pain in the back and vomiting. In renal colic there is hæmaturia, always aggravated by movements, and aching pain in the region of the kidney, sometimes relieved by change of posture. The pain is intense if the calculus enters the ureter, and continues so long as it is passing downwards. The pain is attended with rigors, faintness, and retraction of the testicle. In perityphlitis there is fever with local tenderness, but no hæmaturia. In renal cancer the health is considerably affected, and there is likely to be a tumour, which is diffused and soft. In renal calculus the health is rarely affected, and the tumour is limited and hard.

Prognosis.—As a rule the chances of recovery are great. Patients may suffer from renal stone for years without the health being much affected. Where, from the large size of the stone, the ureter becomes obstructed, hydronephrosis and atrophy of the kidney are apt to follow. Inflammation and abscess are other results, and in such cases the health may be much disturbed. Where both organs are affected, or where complications exist, such as chronic pyelitis, amyloid kidney, or tubercles, the health suffers greatly, emaciation follows, and death is apt to result.

Treatment.—The cause must be ascertained and dealt with. Renal calculi being in a majority of cases formed of uric acid, the development of this diathesis should be prevented. If the patient be plethoric, and living on animal food and highly-seasoned dishes, he must decidedly alter his habits of life. He should observe strict moderation with regard to diet, should take plain but nourishing food in moderation, and avoid all stimulants. In this way digestion and assimilation are improved.

In such patients there is a great tendency for crude matters to find their way into the blood, the uric acid is imperfectly changed, and there is precipitation of various constituents from the urine into the uriniferous tubes. In every case the urine should be examined, and remedies adopted according to the reaction. Where the symptoms point to the existence of a uric acid stone, vegetable diet, gentle exercise, and free use of diluents and alkalies are beneficial. Various mineral waters, with or without baths, may be given. In many cases change of air is highly beneficial. The bowels should be carefully attended to. A course of saline purgative waters is generally very useful in these cases. If the urine continues to be highly acid the patient should take citrate of potash or acetate of potash in twenty- or twenty-five-grain doses every four hours, and continue this treatment with intervals for several weeks. Some use carbonate of lithia, phosphate of soda, and the bicarbonates and tartrates of potash and soda. If the urine should become alkaline this treatment must be suspended for a time. In favorable cases, after a course of this kind, the pain in the lumbar region subsides, small calculi often escape with the urine, and the patient feels well. Creta preparata in twenty- or thirty-grain doses, has been highly extolled for quickly removing the uric acid deposits. This is a safe remedy, even during febrile states. When the calculus is supposed to consist of oxalate of lime the nitro-muriatic acid should be given with henbane and diluents, and continued for some weeks. The functions of the liver and skin should be also promoted. For phosphatic calculi the same treatment may be adopted. Boracic acid has lately been recommended for internal administration in cases of alkaline urine.

When the symptoms are urgent, and are those of renal colic, they may be relieved by narcotics, and chiefly by opium in large and repeated doses, to which belladonna may be added. Other remedies are the subcutaneous injection of morphia and the inhalation of chloroform. Vomiting may be checked by morphia hypodermically injected, and the opium is also useful to relieve vesical irritation. Hot baths and anodyne fomentations are valuable aids. In cases where renal calculi are impacted in the pelvis, and lead to the formation of a tumour, an incision into the kidney may be justifiable. Even extirpation of the kidney has been practised with success.

URÆMIA.

The word signifies urine in the blood, and the term is applied to a group of nervous phenomena, which sometimes occur in the course of acute and chronic Bright's disease and other renal affections, and are due to the prevention of the excretion or to the retention in the blood of certain constituents of the urine.

Causes.—The condition occurs in kidney disease, and pregnancy, parturition, and indulgence in alcohol are exciting causes of the phenomena, where there is a tendency to their occurrence. Two theories have been advanced in order to explain uræmia. Some physiologists suggest that there is œdema of the brain, due to sudden increase of blood-pressure or to sudden increase of the proportion of water in the blood; others refer the changes to accumulation of altered corpuscles within the cerebral capillaries. According to another theory, the process is due to the retention of urea or other excrementitious materials in the blood.

Symptoms.—In uræmia the nervous system is mostly affected, as evidenced by the sensory, motor, and cerebral or mental derangements. The patient suffers from intense and persistent headache, from noises in the ears or deafness, from dimness of sight or blindness. The motor derangements give rise to convulsions or twitchings of muscles; to derangements of the stomach and bowels, as vomiting or diarrhœa; or of the respiratory muscles, as dyspnœa. The mental disorders take the forms of drowsiness, coma, and delirium.

Uræmia exists in two forms, the *acute* and *chronic*. The acute form is one in which the symptoms set in suddenly, and they may begin with coma or convulsions or both. Coma as a first symptom is common in the inflammatory and cirrhotic forms of Bright's disease. In such cases the patient complains of headache, giddiness, dimness of sight, ringing in the ears or deafness, followed by vomiting, and in a short time, violent and acute delirium sets in, ending rapidly in coma. Occasionally the patient suddenly becomes comatose, without any premonitory symptoms. The face is pale, the eyes appear injected, the pupils contracted or dilated, but scarcely sensible to light. There is a peculiar hissing stertor, but not deep snoring such as occurs in cases of cerebral apoplexy. Death usually follows within a few hours. In a few cases the patient rallies for a time or permanently. Where uræmia sets in with convulsions, the attack is generally acute and may simulate epilepsy. There may, however, be no loss of consciousness, and convulsive movements may be confined to a few muscles. Such attacks may be single and solitary, or numerous and occur in rapid succession. They may end in death or recovery. They are characteristic of cirrhotic kidney. Cases often occur in which acute uræmic symptoms set in with convulsions and sudden coma combined. In others there is marked delirium, restlessness, and some difficulty of breathing. The affection often sets in gradually, and is then known as chronic uræmia. This occurs in chronic Bright's disease, but in the inflammatory form it is extremely rare. In this form, as in acute cases, urea, uric acid, and other products are retained in the blood and in the fluids of the tissues. The blood therefore becomes much deteriorated, it grows watery, poor in albumen and corpuscles, and its fibrin becomes relatively increased. The patient gradually becomes listless and indifferent. The speech becomes thick and indistinct; walking and other movements are performed slowly and without determination, and there is severe and persistent headache, ringing in the ears, dimness of sight, or blindness. These symptoms are more or less intermittent, and exacerbations occur. The patient gradually becomes drowsy, and this condition is followed by torpor, and coma sets in. The breathing then becomes stertorous and the patient dies. In some cases instead of lethargy there is muttering delirium, and occasionally the delirium is wild and noisy. Convulsive movements of various kinds, vomiting, and diarrhœa are generally present. Bleeding from the nose is sometimes noticed. For other details connected with uræmia, see vol. i, p. 198.

Diagnosis.—Uræmia more or less resembles other morbid conditions, but is distinguishable from most of them by the history of the case, and by the invariable presence of albumen in the urine. In the acute form, the condition resembles hemiplegia, but there is no paralysis, and the breathing is stridulous rather than stertorous. In epilepsy, there is the cry at the commencement, the paleness of the face, the unilateral character of the convulsions in many cases, and the loss of reflex irritability. From belladonna or opium poisoning uræmia is distinguished by the state of the pupils and the urine. It is often difficult to distinguish uræmic poisoning from alcoholism, and the two conditions may be combined. In alcoholism the odour of the breath is characteristic, and the coma is less profound.

Prognosis.—In a majority of cases the prognosis is unfavorable. Cases due to a variety of causes and occurring during the puerperal state may recover, and the same result is sometimes met with in uræmia occurring in acute Bright's disease. Chronic cases are as a rule fatal; their duration is also short.

Treatment.—In chronic cases the treatment is of little avail. In acute cases, the chief indications are: to remove the cause; to calm the nervous system; to eliminate the *materies morbi* from the blood; to relieve the urgent symptoms; to prevent recurrences, and if uræmia occur during the puerperal period delivery must be effected without unnecessary delay. To promote the secretions of the kidneys and skin various diaphoretics and diuretics must be given from time to time. Locally, dry cupping, leeches or poultices to the loins are useful. Among the non-irritating diuretics, digitalis occupies a pre-eminently high place, and the infusion succeeds better than the tincture. Venesection is very beneficial in acute cases, and drastic purgatives, and diaphoretics as pilocarpin, either subcutaneously or by the mouth, will aid in getting rid of deleterious substances. Convulsions if very severe may be relieved by bromide of potassium, hydrate of chloral, and especially by inhalation of chloroform.

Blood in the Urine—Hæmaturia.

Blood in the urine may be due to morbid states of the system or to diseases of the urinary tract. The term "hæmaturia" signifies that blood is mixed with the urine. The blood may be derived from the substance of the kidney, the ureters or pelvis of the kidney, the bladder, or the urethra.

Causes.—Various morbid states of the system lead to blood in the urine. Thus it is common as a symptom in intense renal hyperæmia, in the early stage of the inflammatory form of Bright's disease, and in the advanced stage of the cirrhotic form. Hæmorrhage also occurs in cases of rupture of the kidney as a result of injury, and may be due to the irritation of renal calculi, and to that caused by drugs, as turpentine and cantharides. Sometimes it is the result of the hæmorrhagic diathesis, or other morbid conditions of the blood, as purpura and scurvy. Occasionally it occurs in the course of or as a sequel to acute fevers. When due to malaria it is known as intermittent hæmaturia. Blood in the urine is sometimes vicarious to menstruation and hæmorrhoids. Hæmaturia may be endemic, as in Egypt, Brazil, and the Mauritius. In such localities the urinary organs often contain parasites known as Bilharzia hæmatobia.

Pathology.—Hæmaturia may be due to the escape of blood from any part of the urinary tract. Hæmorrhage from the kidney is sometimes the result of cancer, tubercle, hydatid, suppurative nephritis, and of concretions within the uriniferous tubes. Hæmorrhage from the pelvis of the kidney or the ureters may be due to calculi. Vesical hæmorrhage results from malignant disease, villous growth, vesical calculi, tubercles in the bladder, or ulceration. Prostatic hæmorrhage is generally due to scrofulous affection and malignant disease. Hæmorrhage from the urethra may be the result of rupture of the vessels or of local inflammation.

Symptoms.—Hæmaturia is recognised by blood in the urine. The quantity discharged varies in different cases. It may be in drops or in large amount. The appearance of the urine varies. The blood may be intimately mixed with it; or there may be coagula or clots. Sometimes the urine is merely smoky or of a faint pink colour, and at other times it resembles pure blood, or is blackish-brown in colour. The blood may be discharged before, after, or with the urine. The urine always contains albumen, and gives a precipitate on standing. The presence of blood is known by guaiacum and turpentine test. Equal parts of the tincture of guaiacum and oil of turpentine are put into a tube and shaken. To this the urine suspected to contain blood is added, when an intense blue is produced. What is known as Heller's test may also be applied, and the spectroscope is useful for detecting very minute traces of blood. Under the microscope the corpuscles can be easily seen; they present their biconcave appearance, but are often small and shrunken; sometimes they are swollen, these differences depending upon the state of concentration of the urine, and the length of time that the blood has been mixed with it.

In hæmorrhage from the kidneys the microscope reveals not only blood, but tube-casts and other renal structures. The blood is diffused throughout the whole urine, which is generally smoky. When the blood is abundant its fibrin coagulates in the ureters, and often appears in the form of round cords resembling lumbrici. Blood from the kidney often coagulates in the urinary passages, and unless expelled blocks up the ureters, and may lead to total obstruction or to symptoms of pyelitis and renal colic. In hæmorrhage from the bladder the blood is often passed alone, either in large or small quantity, and with the last portion of the urine. There is frequent micturition and pain in the hypogastrium. In some cases the blood is passed at the commencement, and after the discharge the urine is nearly clear. The passage of a catheter may reveal the presence of a stone or villous growth. If from the urethra, the blood is passed during the intervals between micturition. Cancer of the kidney is often associated with profuse bleeding, but this symptom is sometimes absent. Hæmaturia, when endemic, is very profuse. In acute congestion of the kidneys due to irritants, as turpentine or cantharides, the hæmorrhage is scanty. Hæmorrhage from the presence of calculi in the kidney is apt to recur frequently, and the blood is constantly increased after exertion. In such cases the microscope often detects uric acid or oxalates in the urinary deposit. It must be remembered that certain medicinal substances, such as rhubarb and senna, when taken internally, impart a red colour to alkaline urine. The absence of corpuscles and the disappearance of the colour on the addition of an acid will distinguish these conditions.

Treatment. — In all cases the cause should be ascertained. Hæmorrhage if slight, and due to congestion, or when occurring in acute Bright's disease, or after a dose of turpentine or cantharides, is salutary. If profuse, it may be relieved by derivatives to the loins as cupping, or by hip-baths and diaphoretics, and cathartics. When bleeding is supplementary to hæmorrhoids, leeches about the anus do good. In severe hæmaturia rest and application of cold by means of ice-bags to the part are useful. The perchloride of iron, alum, matico, turpentine, sulphuric acid, gallic acid, and acetate of lead internally, or ergotine subcutaneously, are useful. If the kidneys are at fault, cold poultices may be applied to the loins. Opium is likely to be serviceable in most cases of hæmaturia. When the bladder is the seat of the hæmorrhage, local treatment, as by injection, is often required.

Hæmatinuria or Paroxysmal Hæmaturia is otherwise known as hæmoglobinuria. It is an affection of the system characterised by paroxysmal attacks of severe rigors followed by the discharge of dark blood-stained urine; during the intervals the patient enjoys perfect health. Only the colouring matter of the blood escapes with the urine, and there is neither rupture of renal capillaries, nor other anatomical changes. The symptom is said to be due to a rapid destruction of blood-disks within the blood-vessels, pelvis of the kidneys, or the bladder. If the urine be boiled either alone or with a little acetic acid, an abundant brownish-red coagulum is formed, and this being boiled with alcohol yields a reddish-brown fluid. Hæmatinuria occurs in purpura hæmorrhagica, putrid fevers, and sometimes in pyæmia and scorbutus.

Causes.—Males alone appear to suffer from this affection, and children are not exempt from it. Its advent can sometimes be traced to exposure to wet and cold. The most important cause is malarious influence. The symptom has a tendency to recur during a long period of years.

Pathology.—Like ague or rheumatism, it has been regarded as an affection of the blood. That it has some relation with the kidneys is gathered from the fact that the attack begins with a chill, attended with congestion of the kidneys, and that these phenomena subside with the discharge of blood-like urine. It may probably be due to the transmission of an influence from the skin to the vaso-motor nerves of the kidneys. The attacks are paroxysmal, but not distinctly periodic.

Symptoms.—There may be no premonitory symptoms and the onset may be quite sudden. Usually, however, there is chilliness, or a feeling of uneasiness across the loins, but no actual suffering, or the attack sets in with cold skin, and rigors. Sometimes it is preceded by furred tongue, jaundice, symptoms of gastric catarrh, as nausea and vomiting, and in some cases there is retraction of the testicles. The temperature may be 95° or 96°. Sometimes the attack is preceded for a few hours or a day by albumen in the urine. In either case the symptoms last for two or three hours, and the patient passes blood-like urine, and there is slight feverishness for a time. The urine next voided is normal and there is no discolouration. In some cases albumen continues in the urine for some time longer. During the attack the urine is of a blackish-red colour, acid or faintly alkaline. The specific gravity is sometimes high, but it varies from 1015 to 1035; sometimes there is excess of urea. It has the appearance of porter, or of muddy port wine, and throws down a thick and copious deposit, containing very few or no blood-disks or any fibrin. There is abundant albumen and granular blood-pigment, numerous hyaline and epithelial tube-casts loaded with brownish granular matter, and often crystals of oxalate of lime. The colour is said to be due to hæmoglobin. After a time the patient feels quite well. The disease is subject to recur, and each subsequent attack exhibits the same range of symptoms as the preceding one. In some cases the recurrences resemble those of ague, and like ague, their attacks may be once, twice, or thrice every day, or once every other day, or quite irregularly. Such variations may last for months. During the attacks the health is seldom deteriorated, and the kidneys do not present any lesion.

Diagnosis.—It is often mistaken for hæmaturia, renal calculus or gravel, and acute Bright's disease. In hæmatinuria there is excess of blood-pigment and very few or none of the blood-corpuscles. These latter abound in hæmaturia. In renal calculus, the duration is long, the deposit contains blood, and the pain is confined to one loin. In acute Bright's disease the urine is albuminous, and the general disturbance is great; dropsy is present, and the onset of the symptoms is gradual.

Treatment.—Antiperiodics have been tried, but are of no avail. Iron to relieve anæmia, and ergot, digitalis, &c., to produce contraction of the arteries of the kidney, have been followed by the same result. The best plan of treatment is prophylactic. Rest in bed, warm clothing, and avoidance of exposure to cold are the best measures to be adopted. Gallic acid alone often succeeds in controlling the hæmorrhage, and to prevent recurrence, quinine, iron, arsenic, or bark may be tried.

ALBUMINURIA.

The occurrence of this important symptom of kidney diseases has been repeatedly referred to in the foregoing chapters; but it seems desirable to give some account of albuminuria as a whole, and to indicate the conditions under which it is especially prone to occur.

In the first place, it should be pointed out that there are two kinds of albuminuria, clearly distinguishable from each other, viz. *true* albuminuria, in which serum-albumin and globulin appear in the urine; and secondly, *false* albuminuria, in which some other albuminous substance is present. In the first of these there is some alteration in the circulation or structure of the kidney, while in the second the source of the albumen may be pus, blood, or the seminal fluid.

True albuminuria is due to one or other of three causes, viz. alteration in the circulation in the kidneys, alterations in the membranes separating the blood from the urine, and lastly, changes in the blood. With regard to the source of the albumen, this, as a general rule, is the blood itself, but it may be derived from the epithelial cells and other tissues of the kidney, as a result of their disintegration. The characteristic of the albumen found in the urine is its coagulability on the application of heat; but non-coagulable substances, such as peptone and its derivatives, which are truly albuminous, are also found in the urine. One of these substances, hemi-albumose, or pro-peptone, is not coagulated by heat, but by nitric and acetic acids, the precipitate caused by the latter being soluble in excess. It therefore follows that, in order invariably to discover the presence of albumen in the urine, some additional tests are requisite besides those mentioned in vol. i, p. 122, especially in doubtful cases. The best methods of testing for albumen are as follows:—1. The urine is acidified with acetic acid, and a concentrated solution of ferrocyanide of potassium is added. This will precipitate all albuminous substances with the exception of peptone. 2. Nitric acid is added to cold urine, and followed by boiling, if any cloudiness results. 3. The urine is acidulated by acetic or nitric acid, and a concentrated solution of chloride of sodium or of sulphate of magnesia is added. If with the second or third of these tests a precipitate is formed, which completely disappears on heating, the presence of pro-peptone is indicated. Perhaps the most delicate reagent of all is the metaphosphoric acid. This precipitates all the albuminous substances, whereas acetic acid and ferrocyanide of potassium do not precipitate peptone. A saturated solution of picric acid is also a good test, especially if citric acid be added in the proportion of two drachms to the ounce.

The structural changes in the kidney which cause albuminuria are acute and chronic inflammation, cirrhosis, and waxy degeneration. In all these affections the circulation in the kidney is more or less altered, the changes being of two principal kinds, viz. increased pressure of blood in the renal arteries, and a similar condition in the renal veins. Of these two factors the latter is by far the more potent; indeed, it may be doubted whether increased pressure in the renal arteries can *per se* produce albuminuria. Venous congestion is the most common cause, and, in the absence of kidney disease, may be due to obstructive disease of the heart or lungs, to disease of the liver, or to pressure on the vena cava or renal veins. A temporary condition of albuminuria is sometimes produced after exposure to severe cold, and is a constant result, in animals at least, of exposure to extremely high temperatures.

According to recent observations albumen in very small quantities is a constituent of *normal* urine, and when it thus appears its quantity is increased by exercise, and during the digestion of albuminous food. When egg-albumen is taken in large quantities a portion of it can always be detected in the urine.

The symptoms of albuminuria have already been sufficiently described in the chapter on Bright's disease, and it was there explained that the treatment of *chronic* cases, by medicine at least, is for the most part unsatisfactory. Iodide of potassium is useful in some cases, and iron is generally regarded as serviceable. Much, however, may be done by hygiene. The amount of nitrogenous food should be limited ; eggs must be strictly forbidden ; green vegetables may be allowed. The use of stimulants should be interdicted, but if considered necessary a little claret will do no great harm. A purely milk diet, with bread and oatmeal, will often yield very satisfactory results. The functions of the skin should be attended to. The patient should avoid chills and active exertion of all kinds. Rest in bed for long periods is often very beneficial, and residence in a warm and dry climate is especially indicated.

CHYLURIA—CHYLO-SEROUS URINE.

This would appear to be a fitting place in which to give some account of a disorder, the probable cause of which has only recently been discovered. The condition in question occurs in tropical and subtropical climates, and prevails endemically in India, the Mauritius, the West Indies, and the Brazils. It is characterised by the peculiar appearance of the urine, which is white and opaque like milk, and sometimes presents a faint rosy tint from slight admixture of blood. On standing the fluid coagulates, and resembles a solution of size. A microscopic nematoid entozoon (*Filaria sanguinis hominis*) is generally found in the blood and urine of the affected persons.

Causes.—Three theories have been advanced: first, it has been supposed that a direct communication exists between the chyle-bearing vessels and the urinary tracts. Secondly, chylous urine has been regarded as a symptom of excess of fat in the blood, this condition being due to derangement of the liver, the result of the presence of the parasite. According to a third view, in cases of chyluria the urinary tract is the seat of an eczematous eruption, associated with hypertrophy of the lymphatic channels, and acquisition by them of gland-properties. With regard to the part played by the *Filariæ*, these parasites have been detected before anything abnormal appeared in the urine. It may be that they act injuriously by causing rupture of the walls of the vessels in which they circulate, with subsequent escape of serous fluids into the urinary tract.

Anatomical characters.—No lesion of any kind is found in the kidneys, indeed, the only recognisable morbid condition is the presence of the parasites, which are found in the small vessels throughout the body. For a description of the parasite itself, the reader is referred to the chapter on Worms in Vol. II.

Symptoms.—There are no premonitory symptoms, and in many cases the appearance of the urine is all that attracts attention. In some patients, symptoms of irritation of the urinary organs have been noticed, and there is generally some amount of debility and depression. Chylo-serous discharges sometimes take place from various parts of the body, as the groins, the axillæ, and the surface of the abdomen; sometimes the scrotum is the seat of elephantiasis, and a serous fluid exudes from the growths.

The milky condition of the urine sometimes appears suddenly. It is always noticed that after the fluid has remained coagulated for a short time, it again becomes partially fluid, and contains flaky clots. This coagulation may take place within the bladder, and cause pain and difficult micturition. The milky appearance is due to the presence of a finely-divided fatty matter, which is dissolved by ether, when the urine assumes its normal appearance. Chylo-serous urine is always coagulated by heat and nitric acid; its behaviour under these various circumstances indicates the presence of fibrin, fat, and albumen. The urine is otherwise normal as regards its ingredients. It contains granular nucleated corpuscles like those of chyle, and sometimes red blood-discs. The fatty matter occurs in the form of very minute granules, resembling the molecular base of chyle.

The progress of the disorder is always intermittent, and without any regular course. During the remissions, the urine returns to a perfectly normal state, and the disorder may go on in this way for several years. The chylous condition of the urine has been noticed to disappear during intercurrent disorders, and as a general rule, rest and fasting diminish the milkiness of the secretion. As time goes on the health usually suffers; the patients complain of more or less lassitude, weakness, and pains in the back and epigastrium. In not a few cases, however, the health remains unimpaired. When death takes place it is occasioned by some independent malady.

Prognosis.—The course of the disorder is essentially chronic; it has been known to continue with intermissions for more than fifty years. In all cases a very guarded opinion should be given as to the probable future, as the disease is wont to recur again and again, and even after long intervals of remission.

Treatment.—Various remedies have been tried, but for the most part without success. The disease often disappears without any remedy, and persists in spite of every endeavour. Iodide of potassium and the perchloride of iron have both been tried, and apparently with some success; but large doses of gallic acid would appear to have yielded the most satisfactory results. Decoction of mangrove bark (*Rhizophora racemosa*) has been found efficacious in Guiana, while in India, a decoction of the seeds of *Nigella sativa* has a considerable reputation. Under the use of vegetable food the urine becomes less chylous, while the discomfort of the patient is said to be relieved by a tight belt around the loins.

Pyelitis.

In this disease the inflammation more especially affects the pelvis and calyces of the kidney. It may be acute or chronic, and may involve both organs or be confined to one. The kidney is rarely the seat of croupous or diphtheritic inflammation, but this sometimes occurs in the typhoid stage of cholera. When the inflammation extends from the pelvis to the interstitial tissue of the kidney it is called pyelo-nephritis.

Causes. — 1. Catarrhal pyelitis is generally caused by renal calculi; rarely by irritants, as turpentine and cantharides. 2. It is an occasional complication of Bright's disease. 3. It is sometimes associated with pregnancy. 4. Morbid states of the blood as in pyæmia, diphtheria, and typhus. 5. Morbid growths, as tubercles, cancer, hydatids, or blood clots. 6. The decomposition of urine in the pelvis and its stagnation from obstruction of the ureter. Extension of gonorrhœa or inflammation from the bladder up the ureters to the kidney. 7. Exposure to cold and wet. 8. Embolism of small arteries of the kidney.

Post-mortem appearances.—The capsule is easily separable, and the structure of the kidney is unaltered. In acute cases the pelvis is enlarged, its vascularity increased; the mucous membrane is reddened by injection, or even by ecchymosis. There are slight extravasations, with softening of the epithelium and the surface is covered with mucus or pus, and sometimes with blood or even with a diphtheritic layer. In severe and long-standing cases, the tailed cells of the pelvis of the kidney are thrown off in large quantity. The mucous membrane has lost its redness, is pale, often thick and swollen and discoloured, and sometimes covered with a deposit of urates. It is very opaque and firm, and often covered with exudations which on separating leave irregular abrasions. The pelvis is dilated, its walls are thickened, and there is often atrophy of the renal parenchyma. The ureter is more or less narrowed; the cavity of the pelvis contains purulent material and *débris*, and sometimes large accumulations of pus and calculous matter. By degrees the substance of the kidney is compressed, its papillæ flattened or obliterated, until it is completely atrophied, leaving a mere sac containing pus. The pus thus mixed with the urine renders the secretion ammoniacal. In these cases the ammoniacal urine throws down a copious deposit of phosphates, which thus thickens the contents of the sac into a mortar-like substance. In other instances, the pus is thickened and forms calcareous deposits. When the disease is due to the lodgment of a calculus, or a blood-clot, there are often ulcerations, and pus may escape externally, as if from an ordinary abscess in the loins. Where the pus and urine fail to find an exit, owing to the ureter being blocked up by a calculus or a clot of blood, the inspissated pus, or deposit in the pelvis, accumulates behind the obstacle and forms an abscess-like cavity called *pyonephrosis*. The matter so confined may ultimately open in any direction.

Symptoms.—The symptoms are those of the primary lesion and of the inflamed pelvis and calyces. Acute catarrh may begin with a rigor, and be attended by fever and uneasiness or acute pain and tenderness in the renal region. The pain shoots in all directions along the line of the ureter and often to the testes, and there is irritability of the bladder with scalding and frequent micturition. If the inflammation be severe there may be vomiting. The most important symptoms are found in the character of the urine. In the early stage it is increased in quantity, turbid, is generally acid, may contain a little blood, or be intimately mixed with mucus, muco-purulent matter, and epithelium cells, detached from the lining membrane of the pelvis. The cells are irregular, spindle-shaped, or three-cornered. As the case advances the urine is mixed with much pus. In such cases the urine soon becomes decomposed and ammoniacal, and also deposits phosphates. When limpid the urine is solely from the healthy kidney, and if examined it does not contain renal casts. When obstruction in the ureter takes place the urine mixed with pus accumulates in the pelvis of the kidney, and forms an elastic fluctuating tumour, and the local symptoms are well-marked. In chronic cases there is aching or well-defined pain in the course of the ureter. The stoppage may persist for a few days or for a few weeks, and the local symptoms are followed by great constitutional disturbances, disorder of the alimentary canal, nausea, vomiting, and diarrhœa. When suppuration has been set up hectic fever appears. The urine is opaque and deposits pus often tinged with blood. These cases last for a long time, and very often the disease extends to the substance of the kidney, or to the cellular tissue around the organ. Chronic cases may lead to marasmus, dropsy, and death.

The calculous variety is characterised by (1) exacerbations of pain, especially after movements of the body; (2) great tendency to hæmorrhage; (3) presence of gravel in the urine. If only one kidney is affected the disease may last for a very long time without any serious impairment to health, even though the kidney may be totally disorganised. In a few cases the abscess may cause death by exhaustion, or by degeneration, or by supervention of complications. Violent pain in the back, difficulty of movement of the spinal column, rigors, and aggravation of fever, indicate threatening perforation. Perforation leads to perinephritis followed by peritonitis. In perforation into the intestine pus may pass by stools, and recovery follows. Where both kidneys are diseased the chances of recovery are very remote. In these cases there is more or less retention of effete matters in the blood. The patient soon presents typhoid symptoms and becomes delirious, and there are sometimes convulsions and coma.

Diagnosis.—Pyelitis in the early stage is known from pus from the bladder or urethra by the characteristic groups of flat, angular or spindle-shaped cells in the urine. In cystitis there is pain in the bladder and frequent micturition, also absence of lumbar pain or uneasiness, and the urine contains a mixture of pus and mucus. In advanced cases of pyelitis pus is discharged with acid urine, and signs of diseases of the bladder, urethra, or prostate are absent. Tenderness in the loins confirms the diagnosis. In pyelitis, when complicated with diseases of the bladder, urethra, or prostate, the diagnosis is often very uncertain; but if the quantity of pus passed every day be very great, if the urine is only feebly decomposed, the loins are painful on pressure, and there is fever with emaciation, the nature of the complaint is tolerably evident. Absence of tube-casts distinguishes simple pyelitis from inflammation of the kidneys.

Prognosis.—The prognosis varies according as the disease affects one or both kidneys, and also with the cause and stage of the disorder. In slight cases it is favorable. Where both kidneys are affected the disease is usually fatal. Where only one organ is diseased the other acts more vigorously, and thus compensates for the other, even though the latter may be completely destroyed. Cancerous or tubercular pyelitis is invariably fatal. In chronic cases the disease is equally serious if complicated with chronic diseases of the bladder, urethra, or prostate. In cases of calculi or hydatids the prognosis is somewhat favorable. Recovery, as a rule, follows in cases due to zymotic causes. Rupture of the dilated sac into the abdomen is fatal, but if the sac opens externally it is a favorable sign.

Treatment.—The cause must be discovered and dealt with. If due to retention of urine from any cause this must be relieved. If due to stone the measures already described in the chapter on calculi must be adopted. Rest is all essential, and the use of hip-baths and poultices to the loins and cuppings over the kidney are useful. Pain may be relieved by opium or subcutaneous injections of morphia. Moderate purgatives and unirritating diaphoretics are very serviceable. The patient should be kept warm in bed and fed on light nutritious diet, chiefly milk. In extreme prostration, or where abscess is threatening, mild stimulants and bark and ammonia may be given. If there is much pus in the urine the bladder should be freely washed out with antiseptics, such as Condy's fluid, solutions of quinine, carbolic acid, or boracic acid. If the disease affect one kidney the patient should take plenty of liquids to keep the urine diluted. To lessen the irritability Liquor Calcis Lactis may be given freely. If the urine be acid alkalies are indicated, and if alkaline, acids. Astringents are highly useful to diminish the discharge of pus. Copaiba, sandal-wood oil, and cubebs may be tried for this purpose.

Anomalies of the Kidney.

These may be divided into three classes—1. As regards form, *e.g.* horse-shoe kidney. 2. Number: absence of one kidney and of corresponding ureter; the other organ is hypertrophied, and does work for both. Occasionally one or more supernumerary kidneys are present. 3. Anomalies of situation. These deviations are often congenital.

Malformations.—Malformation exists in a variety of forms, the commonest one being (1) lobulation, which is a relic of the fœtal condition. 2. Undue development of one kidney. 3. Two pelves to each kidney or two ureters. 4. Horse-shoe kidney. This last consists in the fusion of two kidneys into one, each part possessing a separate pelvis and ureter. In this malformation union is formed by a band of renal tissue at either end, usually the lower. In such cases the concavity is directed upwards, and the ureters descend in front of the transverse portion. 5. Sometimes there is one kidney with two pelves united to a single ureter. All these malformations lead to no important symptoms, unless they give rise to pressure upon the duct or vessels.

Malposition.—The kidney may be displaced congenitally. The most important displacement is moveable kidney, in which one or both kidneys are abnormally mobile. The condition is more common in women than in men, and the patients are generally of the working class. It has been noticed that the displacement is more frequent on the right side than on the left. It is of somewhat common occurrence at the child-bearing period. Difficult labours and successive pregnancies tend to relax the abdominal parietes and the attachments which hold the kidney in its place, and thus favour displacement. The dislocation may also be due to unusual length or irregular distribution of the renal vessels. Its greater frequency on the right side may be due to tight lacing. The pressure exercised on the liver by the stays dislodges the right kidney. On the left side the pressure of the stays can be well borne by the spleen and the stomach, and therefore there are less chances of displacements of the kidney. The displacement may be in any direction, and may be caused by pressure of any enlarged growth in its vicinity, or may be congenital. The kidneys may be found in front of the vertebræ or in the iliac fossa. The congenital anomaly is often associated with changes in the configuration of the kidney, and also with malposition of some of the other abdominal organs, but there is no change in the renal structure. Cases are recorded of congenital misplacement in which the kidney lay on the sacro-iliac synchondrosis, or even between the bladder and the rectum, or across the sacral eminence. Such displacements, when they occur in females, greatly interfere with parturition.

Physical examination.—Misplaced kidney feels like a moderate-sized tumour of a renal form, moveable in the abdomen. It is tender and elastic, and lies in various directions obliquely, or laterally, or directly upwards and outwards, or forwards and inwards, between the umbilicus and the thorax. If grasped, a feeling of sickness is generally produced. It can be easily pushed back into its original place. The kidney lies loose in the abdomen, and when the patient stands, it may descend below the margin of the ribs, or may lie obliquely between the umbilicus and the costal border. The tumour can be pushed in any direction over a space of one or two inches. In persons with attenuated belly, it can be easily grasped. Now and then pulsation of the renal arteries can be felt. When the patient lies in bed he can often thrust the tumour back with his fingers into its normal position in the lumbar region, but on again rising it leaves its place, and the displacement varies with change of posture. There is flattening or hollowing in the lumbar region, and absence of dull sound in the natural position, and the place of the kidney being taken by the intestines a tympanitic sound is heard there.

Symptoms.—In some cases, they are very slight or altogether absent. In others, the misplacement causes great inconvenience. The patient complains of dragging pain, increased on movement; often attended with great uneasiness and disorder of the stomach and bowels and general nervous disturbances. Very often the organ becomes engorged, and there are severe colicky pains with fever and swelling of the tumour in the abdomen. The urine sometimes becomes altered during the attacks, and mucus and even a little blood may be passed with it. The symptoms often recur at intervals during many years, but there is no danger to life. In some cases the tumour may be apparent for a time and then disappear altogether.

Diagnosis.—It may be mistaken for a malignant tumour either in the abdomen or pelvis. In moveable kidney there is (1) a peculiar and sickening sensation, and tenderness on pressure on handling the kidney; (2) renal form of the tumour; (3) clear percussion note in the renal region.

Treatment.—The painful sensations, if any be present, must be relieved. If practicable, the organ must be replaced in its proper position and support afforded by means of a belt or a light bandage. If due to anæmia or to a relaxed condition of the abdomen, support to the abdominal walls by means of bandages or trusses is especially desirable. Iron, quinine, shower-baths, and aperients if necessary, should be prescribed. Tight-lacing and fatiguing exercise should be avoided. If symptoms of engorgement should threaten, perfect rest with cupping in the loins may be tried.

DISEASES OF THE SUPRARENAL CAPSULES.

Addison's Disease—Bronzed Skin Disease.

The suprarenal capsules, like other ductless glands, as the spleen, thymus, and thyroid bodies, assist during health in the proper elaboration of the blood, and when these capsules are diseased, we find a peculiar series of phenomena, one of which is known as bronzed skin. The capsule is a triangular body resembling a cocked hat, and one is placed above each kidney. It is yellowish-red in colour, from one and a half to two inches in length, and about one inch in breadth. Each capsule weighs about a quarter of an ounce. It consists of a cortical or an outer yellow covering made up of elongated vesicles enclosed in a medullary fibrous matrix, and of an inner soft medullary structure, and of a network of connective tissue, the meshes of which are occupied by cells and rounded nuclei. Its nerves have small ganglia, and are chiefly derived from the solar and renal plexuses. The diseases to which the capsules are liable are—1. The morbid changes characteristic of Addison's disease. In connection with these there is characteristic pigmentation and asthenia. 2. Disorders in which there is no pigmentation and no asthenia, and which include changes within the capsule, and changes originating without. The changes originating from without are caries of the spine in which the symptoms often resemble those of Addison's disease. 3. Hypertrophy. 4. Inflammation due to extension from the kidney. 5. Degenerations, either lardaceous or fatty. 6. Hæmorrhages. 7. Malignant disease as sarcoma and carcinoma. The great majority of these conditions are not recognised during life, but are accidentally discovered after death. None of them gives rise to symptoms met with in Addison's disease. 8. Tubercle is by some supposed to be the anatomical change found in Addison's disease, in which pigmentation and asthenia are marked symptoms.

Pathology.—The suprarenal capsules are freely supplied with nerves from the solar and renal plexuses, and from the pneumogastric and phrenic nerves. The nerves are at first irritated, and subsequently they become atrophied and destroyed owing to the contraction of the tissues in which they are embedded. The discolouration of the skin is probably due to the injurious effects of pressure on the sympathetic nerves, but the explanation of the phenomena is very uncertain. They are supposed to be explained by the intimate connection existing between the suprarenal bodies and the sympathetic in the abdomen. It is supposed that these ductless glands influence the condition of the blood. But those who contend against this view assert that in this disease the blood is not altered, and that disease of the sympathetic in the abdomen does not produce Addison's disease. They also point out that in some cases, in which disease of the suprarenal capsules was found *post mortem*, no discolouration existed during life. Again, cases of excessive pigmentation in the *rete mucosum* of the skin have occurred without any disease of the capsules being found.

Pathological appearances in cases of Addison's disease.—The skin is bronze-like and often resembles that of a mulatto. The discolouration is general, it never presents an abrupt margin, but is occasionally in spots. It is most marked on the exposed parts, as the face and hands. It is also very distinct around the nipples, and over the hairy parts as the armpits, the groins, and the genitals; also over the abdomen and in parts in which there has been some local irritation of the surface. Under the microscope there is found accumulation of pigment in the cells of the *rete mucosum.* Miliary tubercles are sometimes found in the suprarenal bodies as in other organs. These undergo various changes, and when degenerated they lead to more or less destruction of the suprarenal bodies. At first the changes are those of chronic inflammation. The capsule is infiltrated with a low form of exudation terminating in caseous degeneration. Under the microscope it consists of trabecular connective tissue with leucocytes freely embedded in the meshes. The capsule is tense, uneven, and in places destroyed. The gland is enlarged, transparent, and homogeneous at first, but after a time it becomes firm and nodulated. In rare instances the organ is small. In many cases the covering of the gland is much thickened, being surrounded by a dense mass of connective tissue which forms adhesions with the neighbouring structures, as the semilunar ganglia and the plexuses of nerves. In these structures important changes take place. The ganglion-cells and the nerves are enclosed in a dense fibrous tissue in which the fibres are also hypertrophic. As a result of compression none of the original structure of nerve-fibres and ganglion-cells remains. There is not mere destruction of the capsules in Addison's disease, for this result often follows in cases of cancer in the neigbouring organ, without any symptoms of Addison's disease. In the early stage, on section, the cut surface presents at first a translucent appearance, and is hard, like cartilage, to the feel. It is grey or greenish-grey, becoming red on exposure, and contains a few portions of a yellow colour which afterwards extend until the whole mass assumes this appearance. Later on, we find cheesy, putty-like nodules, or creamy purulent fluid, or one or more cretaceous masses. This opaque material is indicative of fatty degeneration and resembles in every respect yellow or crude tubercle. With regard to changes in other parts of the body there is a considerable amount of fat over the abdomen, although nutrition has been defective during life. Other changes are found in the absorbent system and the digestive tract. There is swelling of the salivary glands and of the agminated and solitary glands of the bowels. There are also lymphoid deposits on the mucous membrane of the stomach and intestines, and sometimes there are small ulcers in the stomach. Enlargement of the liver and spleen is also observed. The heart is small. In a few cases caries of the vertebræ has been noticed and also abscesses in parts adjoining the capsules, and caseous deposits in the lungs.

Causes.—The disease is mostly constitutional, but some of its factors may possibly be local in character. The disorder, although constitutional, is not propagated by contagion, by infection, or by inheritance. The causes are very obscure. The disease is most common in early adult life, and more frequent in men than in women, and in those whose work exposes them to accidents or injuries. The disease has been supposed to be excited by the extension of inflammatory processes from diseased vertebræ to the suprarenal capsules. The disease is often associated with a highly tubercular or scrofulous constitution; such patients are less able to resist disease, and direct injury or shock to the nervous system may be sufficient to set up the affection. The influence of malaria is a doubtful factor.

Symptoms.—At the beginning these are very vague. The skin generally grows dark, but patients may die before this symptom becomes so marked as to attract notice. In typical cases the first symptoms are anæmia, languor or debility, feeble pulse, irritability of the stomach, and breathlessness on exertion, while the bronzing of the skin appears later, and then becomes the prominent symptom. Other symptoms are not so striking. The patient looks downcast and mournful, walks with stooping gait, and is very apathetic. In a few cases the onset is acute, and there are marked constitutional symptoms, such as a peculiar cachexia, loss of appetite, nausea, vomiting, and even purging; sometimes pain at the pit of the stomach and headache. There is absence of chlorosis, purpura, and of renal and splenic diseases. The conjunctivæ are clear and pearly white or not discoloured, and the nails remain white. Various other symptoms are superadded. Thus (1) breathlessness, which may be due partly to anæmia and partly to impaired innervation; (2) the pulse is quick and feeble, and there is palpitation of the heart; (3) pain and tenderness in the epigastrium and modifications of breathing, as sighing, yawning, and hiccough. (4) Anæmia may give rise to giddiness and even syncope, to which death may be due. Throughout the disease the temperature is diminished, and in a most marked manner towards the close. The disease mostly resembles splenic cachexia. In spurious cases it may look like typhus, but the temperature will distinguish it at once. As the disease progresses there is extreme nervous prostration, excessive and progressive weakness, loss of appetite, and the whole frame becomes flabby. There is no loss of flesh, but sometimes a tendency to the formation of fat. The patient cannot walk for any distance without becoming short of breath and faint or prostrate. The pulse is accelerated and is extremely feeble, soft, and compressible, or small and thready. There is sometimes pain in the back between the scapulæ, and there is occasionally dimness of vision. The urine is scanty, of low specific gravity, and deficient in salts and urea. In the further progress the debility increases, the circulation is less perfect, and there is defective aëration of blood. The patient feels chilly, there is alarming prostration, the hands and limbs become cold, and the lips and nose more livid; nausea and vomiting become more marked, and the breath assumes a peculiarly disagreeable odour. Death is often preceded by delirium, subsultus, and convulsions. In some cases the mind remains clear to the last, and death takes place from asthenia or from faintness.

With regard to the bronzing of the skin, the discolouration sets in slowly, and is not uniform; it may be brownish or dingy (smoky), and is due to the deposit of pigment-granules in the deeper layers of the *rete mucosum.* The discolouration is peculiar and characteristic. It usually commences and is most marked in exposed parts, and in those which are the usual seat of pigment. Thus we find it abundant on the face, where it generally begins, in the neck, and back of the hands, and also in the axillæ, the groins, folds of the legs, round the umbilicus, in the areolæ of the nipples, and over the external genitals. It is deeper in tint in the flexures of the joints than on the extensor surfaces. Generally it shades off gradually. In places where there has been local irritation, as where the skin has been blistered or superficially destroyed, the bronzing presents a deeper colour and has defined margins, but the skin is smooth and supple. Cicatrices affecting the whole of the skin are not so deeply pigmented. In some cases the discolouration is in spots or lines, as on the mucous membrane of the mouth. The gums, cheeks, and tongue also become discoloured, and dark streaks are often seen opposite the angles of the mouth. The disease may last for a long time, and life may be prolonged for some years, and in many cases there are periods of remission followed by severe exacerbation of the symptoms. The prognosis is always unfavorable.

Diagnosis.—Discolouration sometimes occurs in chronic phthisis, leukæmia, syphilis, chronic malarious fevers, and jaundice; but the symptoms of Addison's disease are sufficiently characteristic.

Treatment.—Very little can be done with the effect of stopping the progress of the disease in these cases, but the symptoms may be relieved by careful management. Rest is all essential, and the strength should be increased by attention to diet, which should be nutritious, and such as the patient can best take. The stomach is generally very irritable, but milk, eggs, essence of beef or chicken, fresh raw meat juice, and wines must be tried in succession. Vomiting may sometimes be checked by charcoal and creasote given in drop doses. Iced drinks and iced food are sometimes well borne. All hygienic measures should be attended to. The patient should take exercise in the open air, should wear warm clothing next the skin, and live in a moderate temperature. The bloodlessness may be combated by the neutral preparations of iron, and phosphorus is useful to prevent prostration and lumbar pains. The depression may be removed by stimulants, such as brandy with musk and ammonia. The bowels should be kept regularly open by means of mild aperients, as the compound liquorice powder, cascara sagrada, or Hunyadi Janos water. If diarrhœa exists the ordinary astringents must be given.

END OF VOL. I.

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